

Washington Park ARBORETUM BULLETIN

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Concerning This Issue . . .

Beautiful, subtle, environmentally appropriate, hardy, and drought tolerant. Plants with these characteristics are desirable and much sought after by gardeners and landscapers, alike. Fortunately, they grow all around us. This issue, we present an entire edition on the native plants of Washington State and the Pacific Northwest.

Imposters are all around us, too—Sarah Reichard explains how to tell the difference between a native and a plant that is merely wild. She also brings up important points surrounding natives—native to where? Political boundaries, geographic boundaries? Then Barbara Harris explains where to find native plants that have been grown in an environmentally sensitive manner, and Val Easton explains where to find more information about them.

Pacific Northwest trees are used intentionally in tree plantations overseas. Richard Walker and Stanley Gessel enumerate those trees native here that make “fine forests abroad.”

Arthur Kruckeberg, regional expert on the subject of natives, explores the uses of drought-tolerant native plants in the landscape. Dr. Kruckeberg describes trees and shrubs for the home and park.

View a gallery of native plants on pages 16 and 17, and then read about them in the section that follows. Finally, explore new books available at the Elisabeth C. Miller Library, University of Washington Center for Urban Horticulture, then join with Timothy Hohn to see what’s new around the Arboretum this season.

We welcome four new members to the editorial board of the *Bulletin*. Tom Berger is a landscape architect and principal with The Berger Partnership, Seattle. Jon Hooper, who writes in this issue, is grounds manager for the University of Washington. We are very fortunate that Richard Walker, also an author in this issue, has consented to remain on the board to fill out an unexpired term. Dr. Walker is professor emeritus and former department head of the Botany Department, University of Washington. Daniel Hinkley also has returned to the fold. Dan is an instructor in horticulture at Edmonds Community College and co-owner of Heronswood, the Kingston nursery featuring rare and ornamental plants, landscape installation and maintenance, and consulting services.

I am very grateful for the incredible quality of the board members, authors, and photographers who bring you this issue and help show the best of The Washington Park Arboretum.

Jan Silver, Editor

The Washington Park Arboretum Bulletin

Cover: *Populus tremuloides* (quaking aspen) in montane forest near Leavenworth, Washington. Photo by Clayton Antieau.



E. F. Marten

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Ilex aquifolium in front of *Acer macrophyllum*. Which one is not native to the Pacific Northwest? See page 2.

In Bulletin articles, an asterisk (*) indicates species, including varieties and/or forms, that can be found in the Washington Park Arboretum; a dagger (†) indicates specimens in the public collections of the University of Washington's Center for Urban Horticulture. Limited numbers of plants with an asterisk (*) can be propagated by the Pat Calvert Greenhouse for members of The Arboretum Foundation. The greenhouse, located near the Graham Visitors Center, 2300 Arboretum Drive East, is open from 10-12, Tuesdays.

The Washington Park Arboretum Bulletin is published quarterly, as a bonus of membership in The Arboretum Foundation. The Arboretum Foundation is a non-profit organization that was chartered to further the development of the Washington Park Arboretum, its projects and programs, by means of volunteer service and fundraising. The Washington Park Arboretum is administered through cooperative efforts between the University of Washington, its Center for Urban Horticulture, and the City of Seattle Department of Parks and Recreation. The programs and plant collections are a responsibility of the Center for Urban Horticulture.

The mission of The Arboretum Foundation is to ensure stewardship for the Washington Park Arboretum, a Pacific Northwest treasure, and to provide horticultural leadership for the region. This stewardship requires effective leadership, stable funding, and broad public support.

Articles on gardening and horticulturally related subjects are welcome. Please call the *Bulletin* for guidelines. For permission to reprint any part of the *Arboretum Bulletin*, please contact The Arboretum Foundation for written permission. © 1992 The Arboretum Foundation. ISSN 1046-8749.

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Is This Plant a Native? *Following the Clues*

by Sarah Hayden Reichard

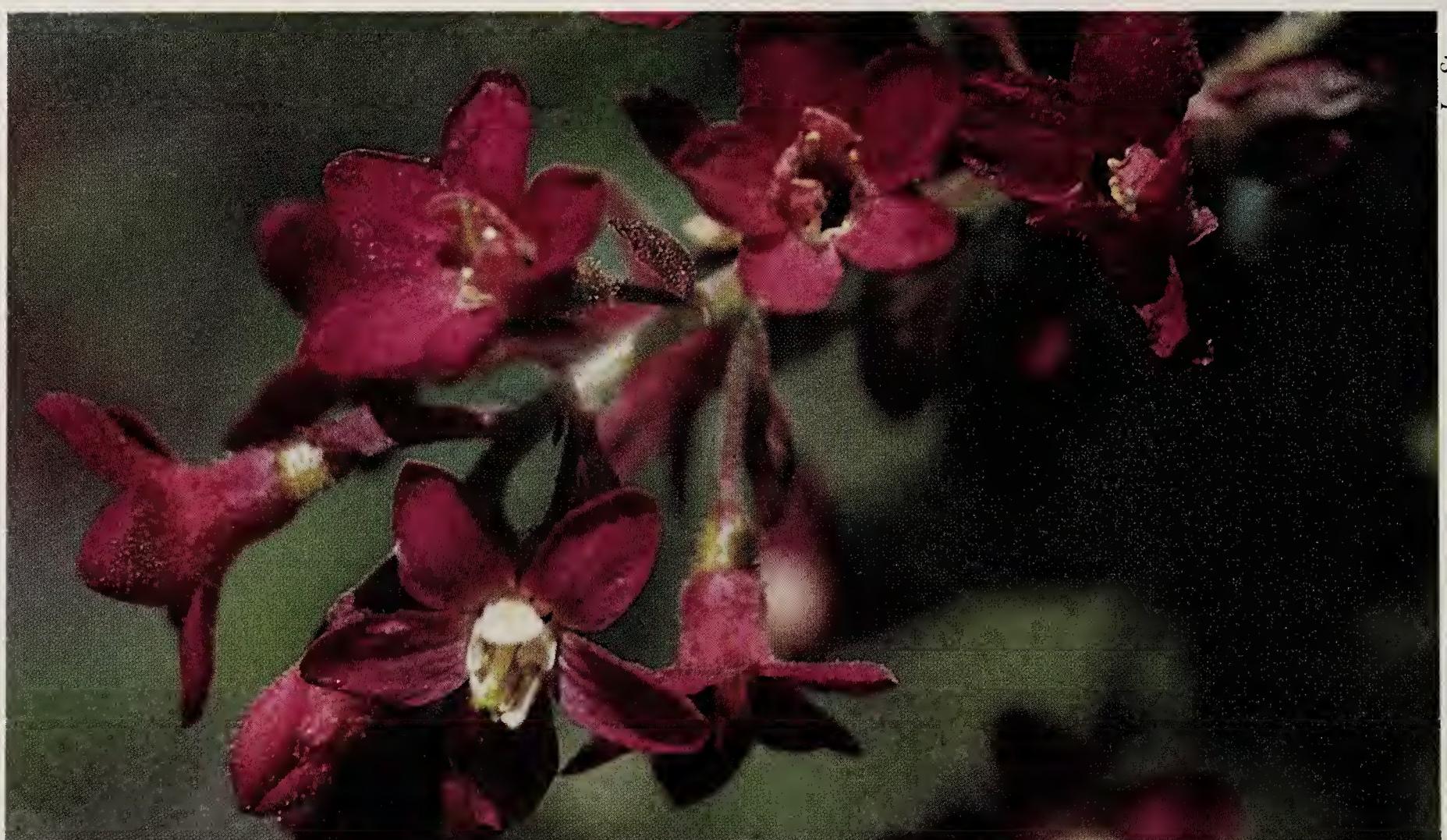
*When considering native plants for your Pacific Northwest garden,
examine the term "native" carefully.*

Every shade of green was represented in the sun-flecked native garden in north Seattle. Light filtered through the rich dark green of the Douglas-fir (**Pseudotsuga menziesii*) on to lush verdant salal



Joy Spurr

Flowers of
Gaultheria shallon
(left) and
Ribes sanguineum,
both native to the
Pacific Northwest.



Joy Spurr

(**Gaultheria shallon*). A reddish-tinged vine maple (**Acer circinatum*) contrasted pleasantly with the light green leaves of red currant (**Ribes sanguineum*), which had just a few vibrant blossoms left. Over in the corner, the eye was drawn to a vivid yellow arrowleaf balsamroot (*Balsamorhiza sagittata*). Above the gray-green manzanita (*Arctostaphylos columbiana*) towered bold spikes of foxglove (*Digitalis purpurea*) flowers.

Wait just a minute! Foxglove—a native? Well, it is common and grows wild in clearings and along margins of Northwest forests. Isn't a wild plant always native? Yet foxglove is a European plant introduced to gardens here sometime around the 1900s. And what about that balsamroot? It, too, grows wild in Washington, but on the *east* side of the Cascade mountain range. How do we decide the boundaries of "native"—are they local, regional, or political? Just what is a native plant, anyway?

What is a Native?

According to the United States Forest Service, a native plant is one that existed in an area before the arrival of Europeans. Here in the Northwest we have a reasonably good idea of what plants are "native," because the area is recently settled. Several distinguished botanists surveyed our flora before we had a chance to adulterate it with introduced plants. Hawaii is more fortunate because there are records of when most introduced plants were brought in, yet it is less fortunate because many more of those species have naturalized.

Our definition of native is workable in areas that have adequate historical documentation, but most do not. And human beings always have shifted plants as they move about, either intentionally—as crop seeds or landscape plants—or inadvertently—by transporting seeds on equipment or livestock. Many of these plants have the ability to "naturalize" by establishing and reproducing themselves outside of human cultivation.

In Europe, plant-shifting activities have gone

on for centuries, so there are several species whose origins are simply not known. Historical records usually are non-existent, so other types of evidence must be used to establish whether a plant "belongs" or not. Because of this uncertainty, European botanists have refined how they determine "native" to a fine art and have developed most of the methods discussed here. Using these methods, a botanist becomes something of a detective, using clues to trace a species' history.

Tracing Geographical Distribution

One clue that is used to determine whether or not a plant is native is geographical distribution. If the distribution of the species is continuous over an area, it is most likely to be native throughout that entire region, but if the distribution is disjunct, origin may be questionable. Discontinuous distributions sometimes occur naturally. More often, however, they signify that the species has been introduced through dispersal by human beings over long distances, from one region to another.

The native status of a plant with a disjunct distribution is especially suspicious if it is known to have the ability to naturalize. An example of this is black locust (**Robinia pseudoacacia*). A native of the southeastern United States, but known to naturalize in the Northeast, black locust may be found in both eastern and western Washington along river and stream banks. One clue is that it has been known to escape in other parts of the United States. Added to that is its disjunct distribution between the Southeast and Northwest, which is unusual. Therefore, black locust is likely to have been introduced here.

Habitat Preference Offers a Clue

Some botanists use habitat preference as an indicator of whether a plant is native or not. Although most non-native, naturalized plants do occur in disturbed sites as field or garden weeds, many native plants, such as alder (**Alnus rubra*), also prefer disturbed conditions. To add to the confusion, several non-native plants, such as English ivy (**Hedera helix*) and English holly (**Ilex aquifolium*), are able to naturalize in dense, *undisturbed* forests. Habitat preference must be considered with other factors to determine a non-native origin, but it should never be taken alone.

What Genes Indicate

A good indicator of plant origin is genetic diversity. Plants that are introduced and naturalized probably derived from a relatively limited number of parent plants. Therefore, each plant's genes would be fairly similar to each other, like brothers

Glossary

Biogeography is the study of the geographical distribution of plants.

Disjunct describes a distribution of a plant in two or more unconnected areas.

Genotype is a class or group of individuals sharing a specific genetic makeup.

Stolon is a horizontal, rooting stem.

and sisters. On the other hand, when a plant is native to an area, with a broad distribution, it has a mixing of genes due to the many parent plants available. By examining its genetic diversity, we would find many forms of the gene present. Unfortunately, the method for determining genetic make-up is very expensive and time-consuming, and therefore impractical for our purposes.

Reproductive Patterns May Be Misleading

A criterion to determine plant origin that has been used in Europe is the reproductive pattern. The theory is that if a plant reproduces mostly by vegetative means (such as stolons or suckers), it is less likely to be native. About 50% of all naturalizing species have vigorous vegetative reproduction, yet many do not. To complicate matters, many native species, especially alpine plants, reproduce vegetatively much of the time. Therefore, this criterion is inadequate to determine native status.

Evolution Clouds the Picture

Native plants also have been defined as plants that have evolved in a region. This definition is unsatisfactory for many reasons. Evolution occurs over a very long period of time. During that period, a given region may go through many climate changes causing the plants to shift their distribution with the climate shifts—one critical aspect of global warming. Such plant shifts can be shown by looking at the fossil record. Fossils found at Republic, Washington, not only include temperate species, but tropical ones such as hibiscus and mahogany. Should such bygone tropical species be described as Northwest natives simply because the climate was once different and led to them being preserved here?

The Puzzle of Boundaries

“Native” must also be considered on a geographical scale. Do we use a historical region, such as the Pacific Northwest; a political boundary, such as Washington State; or a biogeographical region, such as the Puget Sound lowlands? Take the balsamroot. Did it belong in a native garden on the *west* side of the Cascades? And if a garden in Seattle uses a selection of the native species kinnikinnik (**Arctostaphylos uva-ursi*) from Vancouver Island, Canada, such as the University of British Columbia’s wonderful ‘Vancouver Jade’ cultivar, can it still boast of containing a native plant?

To some extent, the way in which we define geography depends on our purpose. If we are talking about the suitability of native landscape plants for a particular climate, we should stick to plants

only from that biogeographic region. When speaking on a legal/conservation level, native plants should be considered within political boundaries, such as Washington, or government agency regions, such as Region 6 of the United States Forest Service. If our goal is to restore a site, it is preferable to define native as those genotypes that have been historically associated with that exact site or as close to it as possible.

Some Plant Origins Stay a Mystery

Some cases may always remain mysterious. Take yarrow (*Achillea millefolium*), for example. It is known to occur in “weedy” places such as along roads and sidewalks, although it also occurs in undisturbed places as well. It is known to “volunteer” or naturalize in places where it has been planted. On the other hand, specimens were collected on Mt. Rainier as far back as 1895 and it is known to have a continuous distribution throughout North America and Europe. There is no historical record of its introduction, however. Native or introduced?

Examining the Evidence

Clearly the best way to decide if a plant is not native is to determine historically that it was introduced, as is the case with the aforementioned foxglove. Barring that, several things can help us establish plant origin by looking at some combinations of: history, continuous geographical distribution, ability to naturalize, habitat preference, genetic diversity, reproductive patterns, and evolution, together with some possible explanation or mechanism for its introduction.

Over the last few years, there has been a resurgence of interest in gardening with native plants. There are many excellent reasons to use natives, including their need for less water, protection of the integrity of our forests from invasive introduced plants and, of course, their beauty and pleasing integration into the landscape. How you describe “native” depends less on any absolute definition and more on your purpose for selecting the plants.

Sarah Hayden Reichard, a native of the southeastern United States, was introduced into Washington sixteen years ago where she has become naturalized. Now virtually indistinguishable from a native, she is a Ph.D. candidate of the University of Washington Center for Urban Horticulture. Her dissertation is on the predictability of naturalizing abilities in introduced plants. Sarah is a long-time active member of the Washington Native Plant Society.

Finding Native Plants in Nurseries

by Barbara Harris

Native plants are increasingly popular in Pacific Northwest gardens. As the demand increases, native plant enthusiasts should make certain that specimens can be obtained without harming the plants in the wild.

You can find many Northwest native plants in the inventory of several Puget Sound nurseries. Most of these native plants are commercially propagated and grown, hence environmentally responsible. Usually the wholesale nursery that offers them propagates and grows them. Most local retail nurseries buy from these wholesalers. Native plants propagated and grown by regional nurseries frequently are small in size.

If you find large native trees and shrubs for sale, they likely were dug in the wild, possibly salvaged when land was cleared for construction or for similar reasons. Ask where and how the more mature specimens you see were taken. This enables you to make sure the removal practices were done with consideration for the environment, and done in a manner that will ensure the plants' survival (e.g., root pruned) when transplanted.

Another way to obtain large plants without harming the environment is to buy named varieties or cultivars. For example, many native plants are being propagated and introduced by the University of British Columbia Botanical Garden (6804 Southwest Marine Drive, Vancouver, British Columbia, Canada V6T 1W5; (604) 822-3928) in cooperation with the British Columbia Nursery Trades Association. Some of these plants are being sold by Puget Sound retail nurseries. The spring Arboretum Foundation plant sale also includes native plants.

Named cultivars are usually propagated and grown by nurseries. Only their wild counterparts exist in nature, so there is no conflict in purchasing cultivars of any size. Examples are †*Ribes sanguineum* 'White Icicle' (flowering currant); **Arctostaphylos uva-ursi* 'Vancouver Jade' (kinnikinnick); †*Potentilla fruticosa* 'Yellow Gem' (shrubby cinquefoil) and *Penstemon fruticosus* 'Purple Haze' (shrubby penstemon).

Barbara Harris is a member of The Arboretum Foundation and coordinator of its native plant study group.



*Penstemon
fruticosus*

Sources of Native Plants

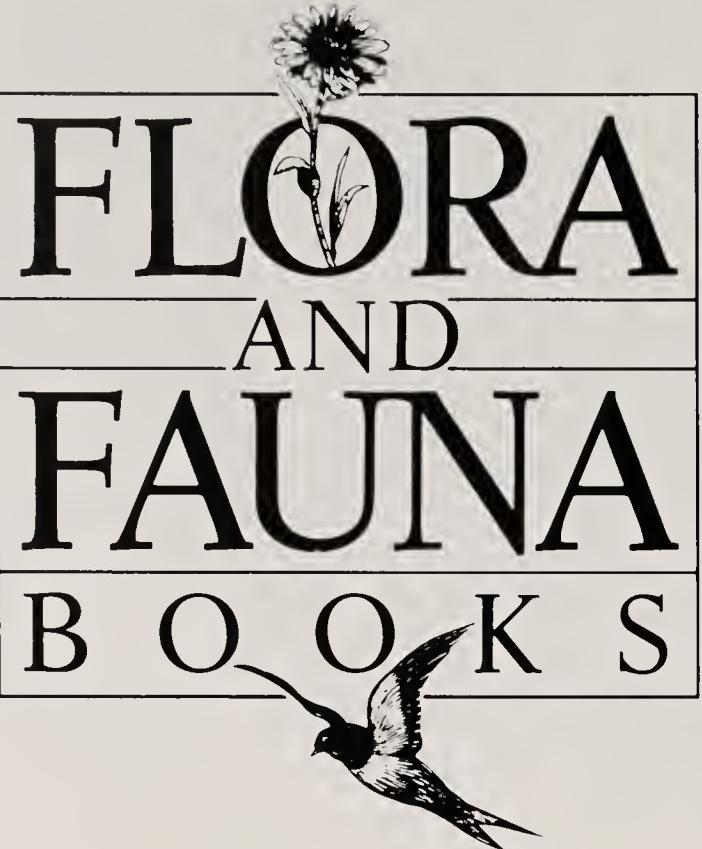
Barfod's Hardy Ferns 23622 Bothell Way SE Bothell, WA 98021 (206) 483-0405	Puget Garden Resources 10322 SW 165th Vashon Island, WA 98070 (206) 547-4542
Madrona Nursery 815-38th Avenue Seattle, WA 98122 (206) 323-8325	Storm Lake Growers 21809-89th SE Snohomish, WA 98290 (206) 794-4842 (wholesale or large quantities only)
MsK Rare Plant Nursery 20066-15th Avenue NW Seattle, WA 98177 (206) 546-1281	Swanson's Nursery 9701 15th Avenue NW Seattle, WA (206) 782-2543 (carries quite a few natives; the buyer is concerned with the sources)
Mt. Tahoma Nursery 28111-112th Avenue E. Graham, WA 98338 (206) 847-9827	Plants of the Wild PO Box 866 Tekoa, WA 99033 (509) 284-2848 (wholesale or large quantities only)



Organizations

The Unit Council of The Arboretum Foundation. Unit Council sponsors both a morning and evening study group on Northwest native plants. It is open to all Foundation members. Contact the Foundation office at (206) 325-4510 for time and place.

The Washington Native Plant Society (WNPS). The mission of WNPS is to promote the appreciation and conservation of Washington's native plants and their habitats through study, education, and advocacy. WNPS produced the Washington Native Plant Society Policy on Collection and Sale of Native Plants, adapted from The Plant Conservation Roundtable. To join WNPS: PO Box 576, Woodinville, WA 98072-0576.



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For Further Information:

Northwest Natives by Valerie Easton

Our Pacific Northwest native plants are comprehensively covered in the following classic and newer works. To locate natives for your home garden, use *Hortus Northwest* (see below) or the catalog collection in the Elisabeth C. Miller Library, which has more than a dozen catalogs from nurseries specializing in Northwest natives.

Clark, Lewis J. *Wild Flowers of the Pacific Northwest*. Sidney, British Columbia, Gray's Publishing Ltd., 1976. ISBN 0-88826-061-X.

Franklin, Jerry F., and C.T. Dyrness. *Natural Vegetation of Oregon and Washington*. Corvallis, Oregon State University Press, 1988. ISBN 0-87071-356-6.

Hitchcock, Leo J., and Arthur Cronquist. *Flora of the Pacific Northwest: An Illustrated Manual*. Seattle, University of Washington Press, 1973. ISBN 0-295-95273-3.

Hitchcock, Leo J., Arthur Cronquist, Marion Ownbey, and J.W. Thompson. *Vascular Plants of the Pacific Northwest*. 5 volumes. Seattle, University of Washington Press, 1969. ISBN 0-395-73983-5.

Kozloff, Eugene N. *Plants and Animals of the Pacific Northwest*. Seattle, University of Washington Press, 1976. ISBN 0-295-95449-3.

Kruckeberg, Arthur R. *Gardening with Native Plants of the Pacific Northwest: An Illustrated Guide*. Seattle, University of Washington Press, 1982. ISBN 0-295-95893-6.

Shank, Dale. *Hortus Northwest: A Pacific Northwest Native Plant Directory and Journal, issue 3*. Canby Oregon, Hortus Northwest, 1992. Issued annually. (\$9.00, including postage and handling, from Hortus Northwest, PO Box 955, Canby, Oregon 97013).

Spurr, Joy. *Wild Shrubs: Finding and Growing Your Own*. Seattle, Pacific Search Press, 1978. ISBN 0-914718-29-0.

Washington Park Arboretum. Ask for the native plants brochure at the Graham Visitors Center.

Weinmann, Fred. *Wetland Plants of the Pacific Northwest*. Seattle, U.S. Army Corps of Engineers, 1985. no ISBN.

Valerie Easton is a librarian at the University of Washington's Center for Urban Horticulture.

Our Native Conifers Make Fine Forests Abroad

by Richard B. Walker
and Stanley P. Gessel

Pacific Northwest conifers have made their way abroad to parks and tree plantations since the eighteenth century. They have shown themselves to be remarkably adaptable and very useful to countries around the world.

Starting with the Explorers

Archibald Menzies, explorer and botanist, reached the Pacific Northwest with the Vancouver Expedition in the 1790s. Lewis and Clark followed in the early 1800s, and Scotsman David Douglas was sent by the Horticultural Society of London in the 1820s. When these and other plant explorers of that early period saw the huge trees of the virgin forests, they were amazed, since no trees of such size existed in Europe or in eastern North America. The explorers and other early visitors often sent seeds and plants of the various species to Britain and to the eastern United States, where they grew well in gardens and parks in regions of mild climates.

David Douglas sent a specimen of what was to be known as a Douglas-fir (**Pseudotsuga menziesii*) to his brother in Scotland, which was planted at Drumlanrig castle about 1832. This tree now has a trunk almost 6 feet (1.8 m) in diameter, a good testimony to the suitability of the site. Other examples of ornamental specimens of Northwest species showing superior growth in Scotland are cited in Mitchell (1983). Mitchell noted that a grand fir (**Abies grandis*) planted in 1875 at Strone, County Argyll, in 1982 measured 197 feet (60 m) tall and 5.68 feet (1.73 m) in diameter.

An early planting of lodgepole pine (**Pinus contorta*) in Britain in 1853 was from seed collected in the Siskiyou Mountains of Oregon by John Jeffrey, an early plant collector in Oregon and California. These trees grew very slowly in Britain, but soon coastal lodgepole pine was introduced; some of this kind of lodgepole pine planted as ornamentals had reached a height of over 70



Noble fir (age 90 years) in a forest district of Sonthofen, Bavaria.

*Photo courtesy of Wolfhard Ruetz,
Bavarian Forestry Institute, Teisendorf*

feet (21 m) by the 1920s.

Likewise, specimens of Sitka spruce were planted on many estates in Britain in the mid-nineteenth century. Also, an early forest plantation of Sitka spruce (**Picea sitchensis*) was made in 1866 in Roxburghshire (southeast Scotland) with a spacing of 20 to 30 feet (6-9 m). The trees had reached heights of up to 120 feet (36 m) and trunk diameters of 5 feet (1.5 m) by the 1950s. Although in nineteenth century Britain most Pacific Northwest conifers were used as ornamental plants, their good growth and success of the early plantations led to more extensive use in forest planting late in that

Glossary

Afforestation is the establishment of plantation forests in areas lacking trees.

Mycorrhizae are special fungi that grow in association with the roots of conifers and some other plants. They facilitate mineral absorption by the trees.

Niche is a restricted place where conditions are suitable for a species to grow and compete well.

Provenance refers to seed or plants from a particular geographic area, often denoted by latitude and altitude.

century, mostly from seed collected from the older ornamental trees. Eventually, importation of seed from specific locations in the United States and British Columbia became common.

Planting of Northwest species in Great Britain continued in the early 1900s, and accelerated in the 1920s. In these decades, many plantations of the following species were established for wood production: Sitka spruce, Douglas-fir, lodgepole pine, western hemlock (**Tsuga heterophylla*), western red cedar (**Thuja plicata*), and Port Orford cedar (**Chamaecyparis lawsoniana*).

Widespread planting of Northwest conifers in Irish gardens also began in the nineteenth century, but their use in forestry was not common there until the 1920s. In continental Europe, all of the species in use in Great Britain, as well as grand and noble fir (**Abies procera*) and ponderosa pine (**Pinus ponderosa*), were being tried in forest plantings late in the nineteenth century and in the early 1900s. Planting of Northwest conifers also began in New Zealand and Australia at least seventy years ago.

Success and Advantages of Introduced Species

Paramount for the success of an introduced species is a compatible climate in the new location. Thus, the moist, mild winters and moderate summer temperatures in Great Britain are favorable for the coastal Northwest species. Likewise, the parts of western Europe that are dominated by maritime weather influences are suitable for them. In the Southern Hemisphere, the mild climates of New Zealand and the more southerly states of Australia up to 1,500-3,000 feet (500 to 1,000 m) altitude are similarly favorable.

With respect to tree adaptability, in most species there are marked differences in rate of growth and growth form, cold and drought hardiness, and other characteristics that depend on geographic origin—especially the latitude and altitude. The term “provenances” is given to plants or seeds from such specific origins. Much effort has been put into determining the most favorable provenances of our Northwest conifers for planting in the different regions of countries using them for forest plantations. For example, a publication recommending provenances for use in Britain is available (British Forestry Commission 1987). Cooperative testing of provenances of Douglas-fir, grand fir and other species continue in several European countries under the auspices



A fine Douglas-fir forest in The Netherlands.
Photo courtesy of Professor C. P. Van Goor,
Agricultural University, Wageningen

of the International Union of Forest Research Organizations.

One feature that is essential for the success of an introduced plant is relative freedom from diseases. Interestingly, this is almost guaranteed by moving a species to a foreign land because insect pests and fungal diseases that are harmful in its native region usually are absent in the new location. However, this also means that the place of introduction likely will not have the mycorrhizal fungi necessary in aiding roots to absorb nutrients. Consequently it may be necessary to bring along appropriate mycorrhizal associates for successful plantings in foreign countries.

From an economic viewpoint, an introduced forest species must produce desirable wood products. Our Northwest species have met this criterion well; the quality of their saw timber or pulp has generally equalled or exceeded that of the indigenous trees. In addition, the growth rate or productivity of an introduced tree must exceed that of the native species for substitution to be worthwhile. In this respect, the discussion below will mention the competitiveness of Northwest species in different countries.

Climate

The need for well-adapted provenances in forestry has been stressed. However, good climatic adaptation is also necessary for successful growing of trees as ornamentals in parks and gardens, although in gardens slow growth rates are toler-

able—sometimes even desirable.

The reason Northwest species are so successful in Europe may be related to the great loss of coniferous and other tree species that occurred there in the last Ice Age. The east-west orientation of the mountain ranges did not allow species to survive by retreating southward, as was possible in North America with its north-south mountain ranges. When the climate returned to pre-Ice Age temperatures, niches became available but remained empty because of this loss of native species. Thus, in present-day Europe there are niches available that can be filled by species from the North American continent. A good and more extensive discussion of issues involved in transferring species to new regions can be found in Wood (1972).

Countries Using Pacific Northwest Species

The Northern Hemisphere

All European countries have some plantations of our most versatile species, Douglas-fir (Hermann 1987); most of them have some representation of the other Northwest species, not only in arboreta but also in the forests. Only the countries discussed below, however, have large areas or major proportions of their forests in these trees.

Great Britain (The United Kingdom): Much of England and Scotland was originally covered by mixed deciduous forests, with the single important coniferous species, Scots pine (*Pinus sylvestris*), occurring mostly in hilly and more northerly



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areas have been available for forestry. These are mostly heathlands, coarse sands, steep slopes and, especially, peatlands and raised bogs. These peaty and boggy areas are unfavorable for Scots pine because of wetness and poor soil aeration. Fortunately, both Sitka spruce and the "shore" variety of lodgepole pine tolerate these wet areas well, and they also stand up well to the influence of winds. Consequently, these two species are the most important ones for forest plantations in Britain. Even on sites where Scots pine can be used, its growth rate is often rather slow. Thus, Sitka spruce, other Northwest species, or Japanese larch (**Larix leptolepis*) may be preferred for new or replacement plantings.

The Irish Republic: Even more so than in the United Kingdom, peaty areas—some virgin and some already mined for peat—are the lands most often available for forestry. However, there are some beautiful Northwest conifers there not only in gardens, but also in older forest plantations on better soils. For example, a 47-year-old stand of Douglas-fir in the Aughavannagh Forest of County Wicklow is one of the principal sources of large power poles for the Republic. In recent years, an active program of afforestation of peat bogs was in progress in Ireland, with some 17,000 acres (6,900 ha) per year being planted by the early 1980s to Sitka spruce (about 60%), shore lodgepole pine (about 18%), Douglas-fir (2%), and the balance in Scots pine and larch. In the boggy areas, planting of the seedlings often is done on

the ridges thrown up between the deep furrows dug by giant plows. More recently, afforestation has declined for both political and economic reasons.

Germany: In the central and northern parts dominated by mild weather patterns from the North Sea, the more frost-tolerant provenances of Douglas-fir are used on some better sites, where this species will out-perform Scots pine. In the Black Forest of southwestern Germany and in Bavaria, Douglas-fir grows well, especially in warmer, drier sites with rather deep soils, where again it can out-perform Scots pine and Norway spruce. In some higher elevation sites at 3,000-4,000 feet (900-1,200 m) in upper Bavaria and in the Black Forest, a few older plantations of noble fir have shown better productivity than either European white fir or Norway spruce.

France: Very large areas have been planted to Douglas-fir since World War II, so that France leads all foreign countries in the area devoted to this species. This is largely in the eastern districts of Lorraine and Alsace; here the more frost-tolerant provenances of Douglas-fir perform very well. There is also a substantial representation of Sitka spruce in France.

The Netherlands: Only very acid sandy soils are available for forest plantations. In the most infertile areas, Scots pine is used, but on somewhat better sands Douglas-fir is planted. Interestingly, there is a fine forest of Douglas-fir planted in 1870 on a good soil near Het Loo, now in a preserve, of which the Dutch are very proud.

Sweden: Although there is a small amount of Sitka spruce planted in southern Sweden (and also southern Norway), the major planting of a Northwest species is in the north, where the mountain provenances of lodgepole pine far exceed the growth rate of the native Scots pine.

The Southern Hemisphere

When we think of conifers in the Southern Hemisphere, the monkey-puzzle tree of Chile (**Araucaria araucana*) or the Norfolk Island pine (*Araucaria heterophylla*) may come to mind. But here, too, our Northwest conifers came into gardens and parks as early as a century ago. Then, a little later, some of them were found useful in forest plantations.

New Zealand: The native New Zealand forests were dominated by some fine but rather slow-growing broadleaved species (notably the several species of *Nothofagus* that may be seen in the Washington Park Arboretum, although they suf-

Table 1. Area in forest plantations of some Pacific Northwest conifers in various countries (thousands of acres +).

	Douglas-fir	Sitka spruce	Lodgepole pine	Western red cedar	Western hemlock
Germany	198	20			
Britain	113	1299	314	13.1	278
Eire		590	198		
France	543	86 + +			
Netherlands	29.7				
Australia					
New S.W.	6.2				
Tasmania	2.5				
New Zealand	55.8		39	3.5	
Sweden		494			

+ To convert acres to hectares multiply by 0.405.

+ + France also has another 160,000 acres of mixed coniferous forests containing a substantial proportion of Sitka spruce.

fered in our harsh winter of 1990-91). Only in the far north of New Zealand was a semi-tropical conifer, the kauri (*Agathis australis*), present in limited areas. After these kauri forests were largely depleted, there was a demand for softwood (coniferous) products, which were largely imported from North America. But early in the twentieth century, Monterey pine (*Pinus radiata*) was introduced from California, found to grow well there, and today makes up the bulk of forest plantations in that country. Nonetheless, there are many good plantings of Douglas-fir of varying ages. At higher elevations and more southerly (cooler) latitudes, it can perform well in comparison with the Monterey pine. Also at higher elevations on difficult sites, lodgepole pine is used to a considerable extent. In the early 1900s ponderosa pine was extensively planted, but its growth rates did not equal that of the Monterey pine.

Australia: As in New Zealand, the native forests were predominately hardwoods, in this case mostly eucalypts, although some large semi-arid areas of low productivity are occupied by cypress pine (*Callitris* spp. in the family Cupressaceae). Again, there was a large demand for softwood timber, and extensive areas have been planted in Monterey pine over the past 70 years. However, there is also a substantial presence of Douglas-fir in New South Wales, Victoria, and Tasmania. Many local seed sources from older plantations have been used there, but seed from southwestern Washington has produced particularly good trees.

Area Abroad Occupied by Northwest Species

Plantation forests of our Northwest species occupy substantial areas in a number of countries (Table 1). The areas given include a range of ages and sizes of trees.

Our native Pacific Northwest conifers comprise a group of vigorous and adaptable species that thrive in many foreign countries with moderate climates. Originally grown only as ornamental plants, often they are now present as timber trees in sizeable and valuable plantation forests, as well.

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Stanley P. Gessel is professor emeritus of Forest Soils, College of Forest Resources, University of Wash-



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ington. Dr. Gessel has observed plantation forests of our Northwest species on several continents.

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Drought-resistant Native Plants

by Arthur R. Kruckeberg

Lately, much attention has been given to plants adapted to tolerate infrequent irrigation. We in Puget Sound country have experienced a succession of warm years, with 1992 the capstone. Low snowpack in the Cascade Range, followed by rainless days in spring and the increasing demands for domestic water supply by humans, all conspire to urge water conservation upon us.

Home gardens and public open spaces are major consumers of water. Besides letting lawns go brown, what can the gardener do to conserve water, yet keep an attractive landscape? One solution is to grow plants tolerant of drought. Californians have taken to growing drought-tolerant natives and exotics. Now it is our turn in the "arid" Pacific Northwest.

The best sources of drought-tolerant plants are regions with Mediterranean-type climates: those with mild winter temperatures and with rainfall mainly confined to the months of October to March. Five major areas of the world have such climates: the Mediterranean region itself, California, South Africa, coastal Chile, and western Australia. So, for the Pacific Northwest, drought-resistant plants from other lands could come from most any of these five winter rain, summer dry regions.

But what of our own Pacific Northwest native plant life? Are there any of proven drought tolerance? Indeed there are! One only has to visit the forest, Puget prairies, or sagebrush country in mid-summer to see native plants adapted to the summer drought. In fact, we on the west side of the Cascade mountain range have a modified Mediterranean climate. We can count on at least two months of drought—July and August, with spells of drought from April through June, often into September.

All of our Puget Sound flora is drought tolerant, excepting, of course, species of the wetlands (bogs, swamps, lake margins, etc.) A walk through the woods in August tells the story. The forest with its towering evergreens, its shrub understory, and the herbaceous plants of the forest floor are all free of the tell-tale drought symptom—wilted foliage. There may be signs of daytime wilting, but with recovery by next morning.

Having evolved in a modified Mediterranean climate, flora west of the Cascades is fit by adaptation to survive the drought months. So, it naturally follows that we can use native plants in gardens to reduce irrigation and still achieve an ornamental landscape.

The number of natives with ornamental value is rich and varied, especially when we broaden the geographic limits of what is native to the Pacific Northwest. Plant geographers have embraced the country from southern British Columbia to northwestern California as the Pacific Northwest, with its eastern boundary being the western slopes of the Rocky Mountains. Summer drought is "old hat"—geologically speaking—to this vast region, at least back as far as the end of the Ice Ages. And the large bioregion of the Pacific Northwest includes plants of uncommon garden value, from the Siskiyous north to the Canadian border.

Selecting Drought-tolerant Native Ornamentals

Where to begin? If all but wetland species are tolerant to drought, an encyclopedic list of low-water use natives could be generated (Kruckeberg 1982). But the list can be shortened by choosing the most ornamental of our native species that are relatively easy of culture and are available commercially. First, it must be emphasized that not all natives are easy to grow, let alone establish from seed or cuttings. A further caveat: reduced need for irrigation does not begin the moment natives are planted. For woody natives (trees and shrubs), it can take at least one season of regular watering to become independent of the garden hose.

Conifers

Since all conifers are more or less drought-tolerant, I single out only those of ornamental value.

True firs. Subalpine fir (**Abies lasiocarpa*) tops my list for garden suitability. Noble fir (**A. procera*) is elegant, but a bit large when mature; it is best in estate or park plantings. The same can be

Glossary

Bract is a modified leaf.

Catkins are slender, usually pendulous, inflorescences.

Dicotyledons are flowering plants with two seed-leaves.

Inflorescences are flower clusters.

Serpentine soils have a high content of a hydrous magnesium silicate (dull green color).

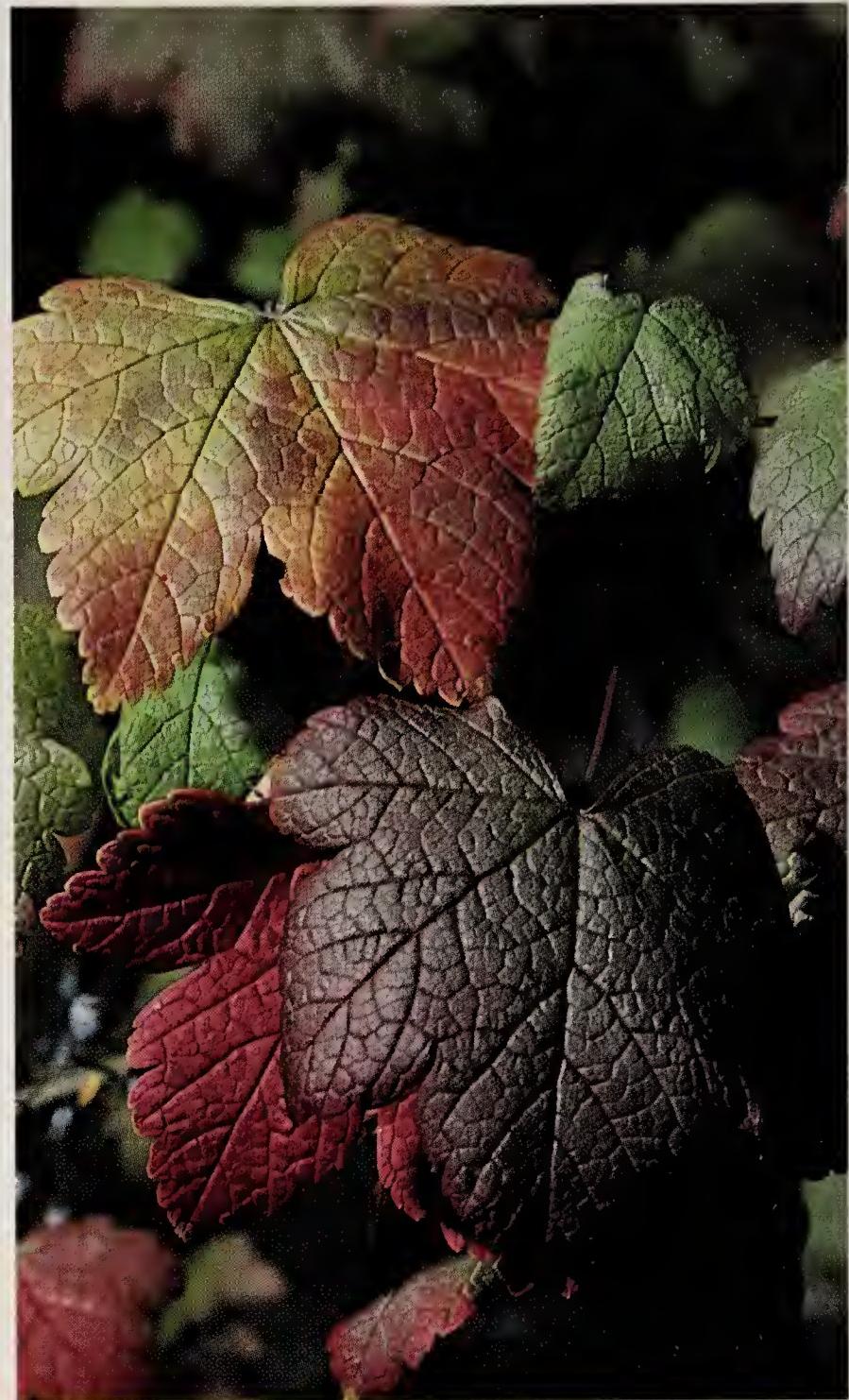
said for grand fir (**A. grandis*), which needs ample growing space. Grand fir from east of the Cascades is best for "dry-side" gardens.

Pines. Our most versatile pine, **Pinus contorta*, comes in both a coastal form—shore pine—and an inland race—lodgepole pine. Ponderosa pine (**P. ponderosa*), though best for plantings east of the Cascades, does well in dry sites in Puget Sound country, but it can outgrow the urban garden. As a park tree in full sun, ponderosa pine displays a bold elegance.

Hemlocks. Both the mountain hemlock (**Tsuga mertensiana*) and the western hemlock (**T. heterophylla*) are superb in cultivation, though mountain hemlock is best suited to a confined space in a sunny border or rock garden. Even though both occur in high rainfall areas, they do tolerate summer drought, thus qualifying as low-water users.

Cedars and junipers. The most drought tolerant is incense cedar (**Calocedrus decurrens*). Once established, this tall tree of slim profile endures

Leaves of *Ribes sanguineum* (red-flowering currant), right. Below, *Mahonia (= Berberis) piperiana* in the Alpine Garden at the University of British Columbia. See the centerfold for other species mentioned in this article.



the driest of summers well. It is dramatic as an accent point in a dry, sunny corner. Western red cedar (**Thuja plicata*), and Port Orford cedar (otherwise known as Lawson cypress, **Chamaecyparis lawsoniana*) are moderately drought resistant, but can get too large for the small garden. With ample room, both can create a tall screen at property borders. Lawson cypress comes in many cultivars, some more suited to confined spaces.

Alaska cedar (**Chamaecyparis nootkatensis*), also moderately drought resistant, is an elegant, though somewhat funereal-looking, cedar that can overpower a small garden. A single specimen against cedar siding is dramatic, however! Rocky Mountain juniper (**Juniperus scopulorum*) has a San Juan Islands population that endures severe summer drought. It is a small, densely branched tree, good for the most exposed situations. The nearly prostrate common juniper (**J. communis* var. *montana*) is at home mostly in the high country, but it adapts well to Puget Sound lowland gardens and is suited to rockery plantings.

Larch. Of our two deciduous conifers, western larch and Lyall's larch, only western larch (**Larix occidentalis*) takes well to lowland plantings. Since it is found only east of the Cascades, you can bet on its drought tolerance. Fine yellow fall color gives way to a leafless tree until the bright green new needle clusters emerge in the spring. It is suited to dry sunny openings in large gardens.

Douglas-fir (**Pseudotsuga menziesii*) is hardly last on the conifer list for any faults; it is simply so common that it will naturally occur in most urban settings. It grows fast to become a huge tree but its drought tolerance is "ace-high."

Broadleaved Evergreens

The oak family gives us three medium-sized trees taking well to sunnier areas. Canyon live oak (**Quercus chrysolepis*) and golden chinquapin (*Chrysolepis chrysophylla*) like sunny borders with drought-tolerant shrubs. Tanbark oak (**Lithocarpus densiflorus*), found in Oregon, has superb leathery foliage, but is a bit too large at maturity for small gardens. Give it ample space in sun or shade on level or sloping sites. Our best-known evergreen, however, is the miraculous madrone (**Arbutus menziesii*). Despite disease problems, it is still much sought after and prefers sun. Be prepared to tolerate madrone's litter because its virtues of foliage, flower, fruit, and glossy bark are amply rewarding.

The Oregon myrtle (California bay laurel, **Umbellularia californica*), despite its usual oc-

currence in nature near water, seems to thrive as well in dry places. Its long narrow leaves are unmistakably aromatic—an exuberant bayleaf! The shrub form from Oregon serpentine soils is also a fine garden subject for open, sunny sites—and even more drought tolerant.

Deciduous Trees

Of our three native maples, only the smaller vine maple (**Acer circinatum*) and Douglas maple (**Acer glabrum*) are suitable for the small garden. Bigleaf maple (**A. macrophyllum*), though elegant in the wild, is much too massive for urban gardens.

Once established, the small maples can easily brave summers without appreciable water. Garry oak (**Quercus garryana*), so well known to Tacomans, Victorians, and Willamette Valley folk, has small populations all the way to southern Vancouver Island. Old specimens are grand, but it is difficult to establish; its growth is slow, however, giving small specimens long-term occupancy in the garden.

Two other deciduous trees are suitable for the wild or woodland garden: bitter cherry (**Prunus emarginata*) is a medium-sized tree on the west side of the Cascades, but a shrub east of the mountains. It will take sun or shade in a woodland setting. The hazel (**Corylus cornuta*) thrives on both sides of the Cascades and can be a bush, arborescent shrub, or a small tree. Its elegant pollen tassels (catkins) emerge in late winter.

Evergreen Shrubs

Several members of the heather family (Ericaceae) are choice evergreen shrubs. Evergreen huckleberry (**Vaccinium ovatum*), with shiny small leaves (often bronzy red in spring) is a favorite companion plant to rhododendrons. Then our own native **Rhododendron macrophyllum* (Washington's state flower), though not as showy as Asiatic species, is both attractive and drought-resistant in open woodland settings. So common, yet so superb an evergreen, salal (**Gaultheria shallon*) has virtues in every category—glossy, leathery foliage; pendent white flowers; and purple fruit—besides being utterly drought tolerant in shade or sun.

Nature has given us three fine manzanitas for full sun on south-facing banks; they go well with salal and evergreen huckleberry. *Arctostaphylos columbiana*, the hairy manzanita, is the tallish one; its prostrate relative is the familiar kinnikinnik (**A. uva-ursi*); and the natural hybrid of the

two is that wonder, *Arctostaphylos x media*. They do not mind at all the absence of summer water.

Wild lilacs, species of *Ceanothus*, merit garden use in Puget Sound country. *Ceanothus velutinus* (especially its west-side variant along Hood Canal, variety *laevigatus*), can get up to 25 feet, and has masses of creamy white flowers in late spring.

The Oregon grapes are a clan of evergreens from nearly prostrate **Mahonia repens* to the tall rangy **M. aquifolium*. I encourage their use in sunny borders, as well as that of two lesser-known Oregonians: *Mahonia* (or *Berberis*) *piperiana* and *M. pumila*.

Deciduous Shrubs

From a long list in this category we are constrained to pick a few of the best, all drought tolerant. Indian plum (**Oemleria cerasiformis*) ushers in spring earlier than all other shrubs, in mid-March. Both female and male plants are decked out in pendent greenish-yellow spiky flower clusters, and by mid-summer the female can be laden with purplish black fruits, also avidly taken by birds.

Two heather family shrubs are at home in dry woodland settings: red huckleberry (**Vaccinium parvifolium*) and fool's huckleberry or rustyleaf (**Menziesia ferruginea*). Our native serviceberry (**Amelanchier alnifolia*), from 8 to 25 feet tall, likes sunny openings bordering woods. Superb in flower and fruit, with leaves going yellow in fall, serviceberry is at home throughout the Northwest. Our finest deciduous wild lilac (deer brush, **Ceanothus integerrimus*) reaches southern Washington where it is a common roadside sight, a tall shrub in full sun. Massively clothed with spiky flower clusters from pure white to deep lilac, each flower is a tiny jewel.

British authorities rate our native mock orange (**Philadelphus lewisii*) as the finest of the clan. Look for it in full sun, either side of the Cascades. Perhaps the earliest introduction to British gardens was our red flowering currant (**Ribes sanguineum*). It has been extolled abroad for its flowers and finally is coming into gardens in its native land. Some cultivars come in deep red flowers, whereas others have pure white blooms. They do well in sun or partial shade. The glossy pale blue fruits are a favorite with local birds.

Be surprised by an oak in the shrub roster. Brewer's oak (**Quercus breweri*) is a neat tallish shrub, an evident kin to Garry oak. Easy from acorns harvested in the fall on a "must" trip to the Siskiyous, it slowly becomes a multi-branched

shrub, suited to the dry, sunny shrub border.

Showy vines are rare in the Pacific Northwest, yet one—the orange honeysuckle (**Lonicera ciliosa*)—is common in our area. It can twine its way well up into a handy Douglas-fir; the pendent twigs put on a show with clusters of orangey-red tubular flowers skirted by a broadly rounded bract (modified leaf).

A final gaggle of deciduous shrubs to tempt the wild garden enthusiast: There are two fine wild roses (**Rosa gymnocarpa* and **R. nutkana*) with elegant pink single flowers. Three species of spiraea, *Spiraea betulifolia* var. *lucida* (white flower), *S. densiflora* (deep pink), and a choice hybrid of Nature, *S. pyramidata* (soft pink). And then the ever-present snowberry (**Symphoricarpos*), a rambler with pure white fruits persisting all winter. All these medium-sized shrubs are happy in partial to full sun, especially in the informal setting of the woodland garden.

This brief account of Pacific Northwest native treasures should get the serious water conservers started. Remember: drought tolerance is not instantaneous. Only after a season of frugal watering can the garden of lower water use be put to the test. And a further counsel: One need not stick to just Pacific Northwest natives. Plants from other Mediterranean climates can be happily intermixed for a drought-tolerant garden.

More Reading

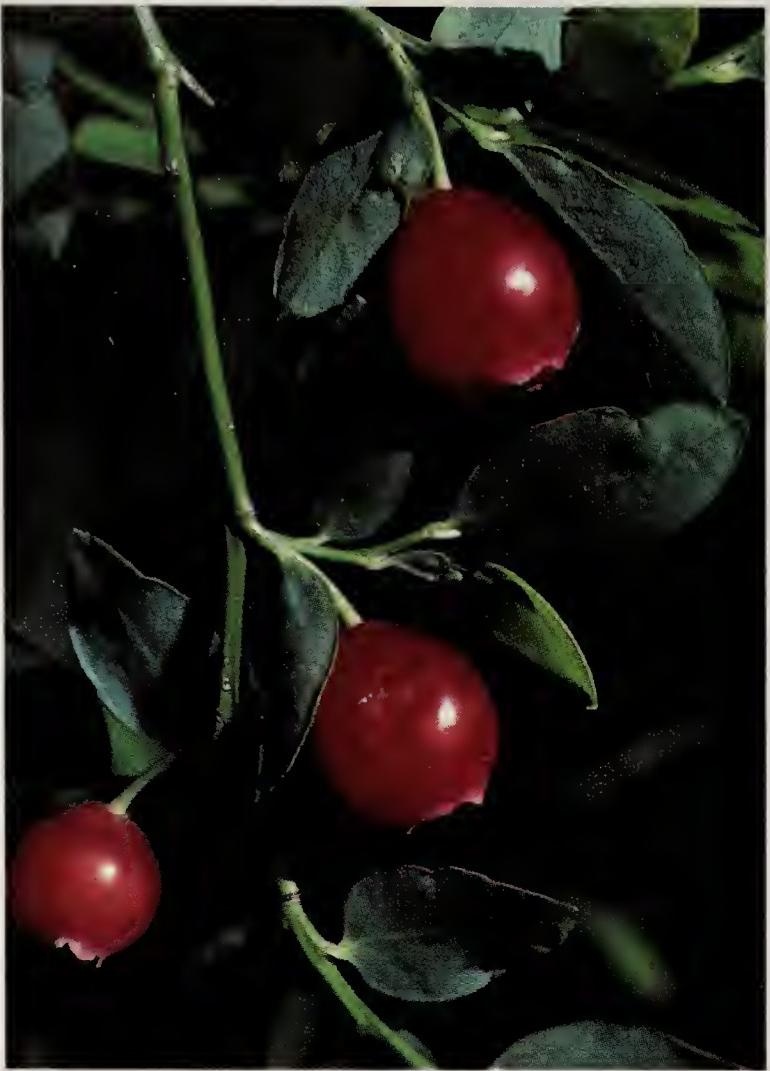
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Kruckeberg, Arthur R. 1991. *The Natural History of Puget Sound Country*. Chapter 2 (climate) and chapter 5 (lowland forest habitats). Seattle: University of Washington Press. Gives an ecological perspective of our region's near-Mediterranean summers and its drought-adapted flora.

Pinyuh, George. Bulletin 125. Pullman, Washington: King County Cooperative Extension Service. Includes some natives.

For plants suitable in our summer dry/winter rain climate, see the "Plants of the Winter Rain" articles, 1 through 5, in the *Washington Park Arboretum Bulletin*. The series started in 1986 (49:3) and ended in 1990 (53:1).

Arthur R. Kruckeberg is professor emeritus of botany at the University of Washington. He helped found the Washington Native Plant Society. Dr. Kruckeberg's most recent book is *The Natural History of Puget Sound Country*.



A Gallery of Natives in the Washington Landscape

This page, clockwise: *Vaccinium parvifolium* (red huckleberry) • *Paxistima myrtifolia* • *Juniperus scopulorum* on Orcas Island • the winged samara of *Acer circinatum*.

Opposite page, clockwise: *Rosa nutkana* from Whidbey Island • *Penstemon fruticosus* • the fruits of *Amelanchier alnifolia* (Saskatoon fruit).



Margaret Mulligan



Arthur R. Kruckeberg



Joy Spurri



Mountain Box

by Jan Pirzio-Biroli

The mountain box, **Paxistima myrtifolia*, is an understory plant of Northwest forests, frequently seen at mid-elevations—and frequently ignored. Perhaps the reason for such lack of attention is that this species often occurs as a population of scattered plants in relatively deep shade, thus is rarely seen in bloom.

Many years ago, my husband and I planted a single rooted cutting at the corner of a decaying cedar log in a new bed, in relatively light shade. Our single plant soon spread to nearly three feet wide and half as tall. At its peak it was covered each year with minute reddish flowers occurring in the axils of the evergreen leaves.

Over the years, our enthusiasm for gardening caused our *Paxistima* to be surrounded by azaleas, rhododendrons, subalpine fir (**Abies lasiocarpa*), salal (**Gaultheria shallon*), *Spiraea betulifolia* (another Northwest native), and various ferns. One of the firs is now over 25 feet tall; the decaying log has decayed into non-existence; the bordering path was long ago swallowed by more aggressive members of this population. Obviously, this is a bed that needs revision.

And what has happened to the *Paxistima*? Suckers (or seedlings) remain in scattered colonies in dense shade, fading into the evergreen cover of stronger competitors. One of our plans for a (hopefully!) moist autumn of 1992 is to rescue these remnants and reestablish them in brighter environments. We hope that once more they can develop the dense habit of the original plant and once more come into bloom.

Paxistima is a native North American genus consisting of two species: *P. myrtifolia*, which grows at mid elevations from British Columbia to California, east to the base of the Rocky Mountains, and *P. canbyi*, native to the mountains of Virginia and bordering states to the west. Occasionally, *P. myrtifolia* may even be found in coastal regions of Washington State. View it in the Rock Garden of the Washington Park Arboretum.

A member of the family Celastraceae, *Paxistima* is more closely related to **Euonymus*, the spindle tree, than to boxwood. The glossy evergreen leaves of our species are rarely more than an inch long, with serrate margins and arranged op-



Jeanne R. Jannish

Paxistima myrtifolia, from Hitchcock et al, 1969,
courtesy, University of Washington Press.
See a color photo on page 16.

positely on the branches. The flowers, only an eighth-inch in diameter, have parts in fours (see illustration): four petals alternating with four stamens are arranged around a broad disc from which arises a single style. They may occur singly or in few-flowered cymes in the axils of the leaves.

Many years ago I brought from my aunt's house in the eastern United States a small piece of *Paxistima canbyi*, which thrived there as a low foundation planting and where it spread joyously in half sun. In our garden, it has been slow to develop, probably because it is restricted to calcareous rocks and slopes in the eastern United States (*Gray's Manual* 1950) and would be best suited to the same conditions in a rock garden.

The nomenclature of the genus and of this species has a long history of dispute. Botanist C. Leo Hitchcock preferred to spell the species name with "ch" instead of "x" and the specific name *myrsinoides* (Hitchcock 1969), whereas Bean (1976) is adamant in adopting the spelling and specific name that is presently in common usage. It is important for the reader to realize that descriptions of our plant may be found with any of these variations, depending upon the reference used.

We are not alone in our fondness for this self-facing shrub. In *Vascular Plants of the Pacific*

Northwest (Hitchcock 1969), Dr. Hitchcock, who was one of the premier gardeners of his time as well as the botanical authority for our native plants, devoted the following paragraph to its praise:

This is surely one of the finest low-growing shrubs of the Northwest, readily adaptable to shady or open, well-drained sites, graceful when growing untouched but readily shaped into a low hedge. Although the flowers are somewhat inconspicuous, nevertheless they have real beauty, but it is because of the handsome, glossy, evergreen leaves that the plant is rated so highly.

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Pacific Coast Iris

Text and photo
by Daniel Borroff

More than 15 years ago a pair of strap-shaped leaves emerged from the soil in a recently tilled section of the garden at my new home. They were dark and lustrous, unlike any weed, so I let them be. After a year, the plant became a clump of arching leaves about 14 inches tall and 20 inches across, arranged in fans. The slender leaves were just a bit wider than half an inch. In May it produced a rather dull lavender-colored flower. It was an iris, but which iris? I wouldn't know for seven years.

Over time, with my encouragement, the solitary plant had spread to a mass 15 feet long and three feet across. Soil amended with organic matter increased the growth rate but it putted along, at a slower pace, even in patches where the soil was the original sterile clay.

Every May the flowers bloomed obligingly with one exception. In 1978, winter temperatures in the teens burned all of the foliage. I cut back this sorry mess and probably all the flowering shoots. By April, the foliage was more handsome than ever, but no flowers came that year.

Few weeds grew in the clump with this iris, and despite its healthy spread, it didn't invade the territory of any other plants. Pests and diseases seemed no problem—just an occasional nibble from an errant slug or root weevil or an earwig burrowed into the seedpod. What a miracle plant!

The only habitats the plant didn't seem to care for were dense shade and waterlogged soil. Now, if only something could be done about the rather dull flowers that everyone seemed to find more delightful than I did.

The answer to my prayers arrived in the person of Dennis Thompson, one of my horticulture instructors at Edmonds Community College. He identified the mystery iris. It was *Iris douglasiana*, one of seven or so Pacific Coast iris. They occur near the coast from Santa Barbara, California, to southern Oregon in grasslands and open woodlands. Two species, *Iris tenax* and *I. tenuis*, both deciduous, occur in Oregon and southern Washington State west of the Cascades. They hybridize readily both in the wild, where their ranges overlap, and in cultivation, to the delight of gardeners but not taxonomists. Species from the southern portion of their range tend to be less hardy, of course, and will only survive our mildest winters, succumbing to winter cold and wet. *Iris munzii*, the source of the most spectacular shades of blue and turquoise, is one whose southern roots betray the source of its progeny.

Dennis introduced me to iris expert Jean Witt, a member of The Arboretum Foundation and the Iris Society. Visiting Jean's collection of named plants and

her own hybrids was like a trip to the candy factory. The colors ranged from white to yellow to purple in pastels and vibrant shades, and a few rusty reds. There were ruffled flowers with wide falls and elegant flowers with smooth slender falls.

Jean offered to sell a selection of her plants that would be most suited to landscaping. She would divide them that autumn when they broke summer dormancy and began to produce new roots. These divisions are dipped in a systemic fungicide prior to planting to improve their survival, but the wait was a challenge for me. Finally, I'd found my dream plant, yet for landscaping purposes they would be unavailable during my busiest season, spring through summer. I'd have to keep them in containers through the winter.

Since then I've seen species of Pacific Coast iris



Unnamed 'Pacific Coast' hybrid

blooming along the coast near Western Hills Nursery in Occidental, California, in uncountable numbers. (Like most *Iris* they are moderately poisonous and are not grazed by pasture animals; as a result, their numbers have increased to the point that many farmers consider them to be a noxious pest.) Wintergreen Nursery, in Watsonville, California, sadly no longer in existence, grew half a hundred hybrids and selections in gallon pots. The last time I saw the nursery there must have been upwards of 1,000 plants in stock. Fortunately for me, two local nurseries, Puget Garden Resources and Heronswood, now grow them in containers. They are at last readily available at any time of year.

As a landscape designer, it is a source of amusement and frustration to be accused of using certain "signature" plants. More often than not, the label is simply not true. However, I would welcome calling my "signature" the Pacific Coast iris—along with about 20 other plants, of course! But the P. C. iris, as they're frequently called, would be near the top of the list.

In addition to their value as ground cover, Pacific Coast iris species make ideal foreground plantings in mixed borders and shrub plantings, reaching a discreet distance across paths or edgings. Their strong dark foliage with its clear linear character provides a good foil to many plants with lighter foliage and rescues many a scheme that includes too many plants whose foliage is undistinguished or weak. Many forms will cover themselves with bloom for nearly a month. The few seedlings that occur, usually near the parent plant, are a welcome addition, to be given to friends or added to other locations in the garden. Since some are native to coastal California with its wet winters and long cool dry summers, they will adapt to our climate with no additional water except in the sandiest soils. They now provide ground cover in the Northwest Perennial Alliance's "drought-tolerant" borders, which I maintain at the Good Shepherd Center in Seattle's Wallingford district. These aristocratic natives will also lend a distinguished note to your garden.

Dan Borroff has a small custom landscaping business in Seattle. He has championed 'Pacific Coast' iris, garden-worthy plants, and drought-tolerant design for the past ten years.



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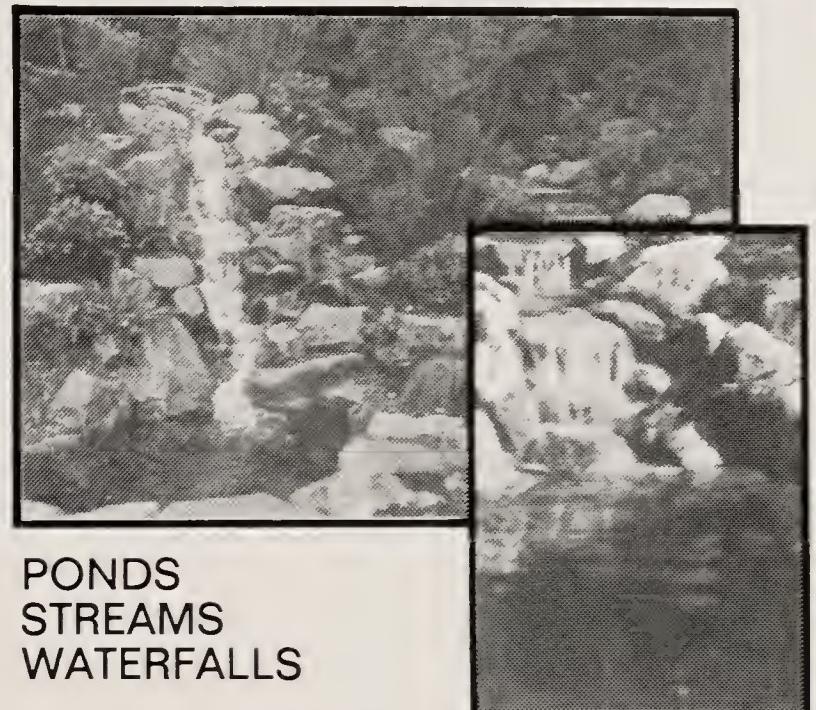
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Joy Spurr

Amelanchier alnifolia. See a color photo of the fruit on page 17.

Western Serviceberry

by Clayton Antieau

Few deciduous shrubs are as beautiful as the Pacific Northwest's native serviceberry in bloom, fruit, or fall color; unfortunately, few are as short-lived in flower, fruit, or fall color. Thus is the paradox of western serviceberry (**Amelanchier alnifolia*).

This plant is found from Saskatchewan west to British Columbia, then south to northern California. Native to nearly all of Washington State except the driest, hottest corners of the Columbia Basin, this species thrives in sunny, well-drained environments from sea level to mid-elevations in the mountains. The Arboretum's cultivated specimens are on the hill southwest of the Lookout.

It is most easily spotted during late April through early June as plants pass into and out of flower, just after the blue-green leaves have fully expanded. The flower show is spectacular as white, five-petaled, rose-flowers unfold. The spectacle can be only a day or two long, however, as wind and rain easily detach the petals.

Flowers are quickly followed by small-and-tangy edible fruits about the size of a small pea. These turn from green-yellow to rosy-orange to deep purple-red. The earliest of our native edible shrubs to bear fruit upon flowering, western serviceberry is irresistible to birds and squirrels. Consider yourself lucky if you find a plant laden with ripe fruit. Like other species in this genus, our native serviceberry is also notable for grand, but short-lived, fall color in clear orange/red hues.

In Northwest gardens, western serviceberry of-

fers ornamental value in all seasons except winter, when it is bare of leaves. Plants tend to be wide-spreading, and usually attain heights of 10-12 feet in fertile, sunny locations in western Washington. Because of this habit, the species is best used in a shrub border, a native or woodland garden, or in background plantings for other ornamentals. Foliage provides an excellent neutral stage for herbaceous perennials or annuals.

Another tact that might be considered is to train a plant into a small tree. Although the natural tendency of western serviceberry is to be bushy but without suckers, careful selection and maintenance of a single main stem would allow it to be a wonderful small fruit-bearing tree for urban situations and close spaces. Only a few years of training are needed to establish such a specimen.

Being a Northwest native, this species is well-adapted to our summer-dry conditions and does not need irrigation once established. The only insect pest that I have observed on this plant is an eastern Washington weevil that consumes half-moons from the petals. I have not seen this problem in western Washington. Among other pests, deer and elk must certainly be counted. Serviceberry is a delectable winter browse plant for these animals in montane and rural environments.

Propagate this species by collecting seed in early summer (in fresh fruits) or fall (in naturally dried or mummified fruits). Clean the seed from the fruit pulp and store the seed in moist vermiculite or perlite in the refrigerator for about three months. Sow the seed the following spring. Seedlings and saplings transplant without problem. Serviceberry is also well-behaved in its growth, so should not need pruning if placed in a suitably sized location. However, if needed, pruning should be done in winter, as flowering occurs on the current season's growth.

Western serviceberry has been widely used for several years as a revegetation species for restoration of disturbed upland environments and wetland buffers. Its refined ornamental characteristics and simple cultural requirements offer hope that this species will become a standard drought-tolerant element of Northwest ornamental landscapes.

Clayton Antieau is a horticulturist, botanist, and instructor specializing in native flora of the Pacific Northwest. He is executive president of the Washington Native Plant Society and explores the cultivation and propagation of native species in his garden and in the classroom.

Long-leaf Oregon Grape, Snowberry, & Salal

by Jon C. Hooper

**Mahonia nervosa* (long-leaf Oregon grape), **Symporicarpos albus* (snowberry), and **Gaultheria shallon* (salal) are three distinctive native plants that can give a great deal of character and interest to any natural Northwest landscape. These are plants that blend into the landscape while giving it distinct color, texture, and accent.

All three of these plants are traditionally used for understory plantings, yet they can be maintained to take on various functions such as a ground cover, a border shrub, or as a hedge. An example is the use of salal in a thick ground cover of ten inches in height, as a tight four-foot hedge, or as an understory plant. Once established, these plants are hardy, drought tolerant, and tough. Let me tell you a little more about them.



Long-leaf Oregon grape is native from British Columbia to California and Idaho. It grows to about a height of two feet and has three to ten pairs of spiny tooth leaflets on each leaf. The one-to three-inch leaflets are a bit leathery but their dramatic looks add a great deal of excitement and contrast to surrounding plants. As is typical of most *Mahonia*, this plant has yellow flowers in upright clusters three to six inches in length that will develop into blue berries. *Mahonia nervosa* establishes best in shade but will tolerate full sun

in milder areas. Being a good drought-tolerant plant, it also fits in well with any water conservation landscape. I find that *M. nervosa* is superior as a woodland ground cover under majestic evergreens or as a sharp contrasting front border to large shrubs and trees. With its sharp edges and thorny fern look, *Mahonia* can be a very effective and beautiful complementary plant in your landscape.

Snowberry, native to North America, is a spreading low-growing three-foot-tall deciduous shrub. The main ornamental feature of snowberry is its white round berry-like fruits that stay on the plant into the winter, long after the roundish two-inch leaves have fallen. Not considered a great shrub by many because of its suckering habit and erratic spreading characteristics, I find it to be a wonderful complementary shrub due to the contrast of its bright white berries against native evergreen plantings. The key to using this plant is to keep it under control by selectively thinning and pruning out old shoots and branches. It can be kept in check to achieve any purpose you might have for it in the landscape. Snowberry does well in poorly drained soil and is tolerant of pollution and shade. It is not an easy plant to propagate, so it may not be readily available in your local nursery.

Salal is native from California to British Columbia. This plant grows in all types of conditions and can be used in many ways. Traditionally it is grown as a one- to two-foot-tall ground cover with 1½ to 3" bright green leaves. The pink/white bellflowers will develop into black huckleberry-shaped edible fruits when grown in full sun. Salal will tolerate dry soil, so fits very well into a water conservation program. Once established, it is easy to grow but pruning and thinning are required to maintain the shape of this fast-growing plant. Salal can grow to ten feet in shade, so it is important to plant it in an appropriate place for the intended purpose. If you are looking for a more compact species, consider **Gaultheria procumbens* (wintergreen). All three of these species can be found around the Washington Park Arboretum.

Jon C. Hooper is the grounds manager for the University of Washington. He has over 20 years of experience in the management of grounds operations and landscape construction and development. At the University of Washington Jon is responsible for maintaining one of the largest groups of plant collections in the Northwest.

Mosses in the Garden

by Virginia Lee Ellis

Enough though the use of mosses in landscaping was promoted in the United States as early as 1931 (Grout 1931), mosses are still considered pests to eradicate or indicators of poor garden conditions. Yet an advantage to gardening with mosses is that dense shade, high moisture, and even heavy clayey soil that would be detrimental to other plants can be ideal conditions for a carpeting of moss. If you observe mosses carefully, you will see that each species has its own distinctive texture and color to contribute to otherwise bare shady spots, thus giving added interest to a leisurely stroll through the garden.

Growing Moss

If you wish to introduce mosses to your garden, pay close attention to the environmental conditions in which each moss naturally thrives so that you can choose species suitable for the particular conditions of your garden.

The most important factors to observe for successful introduction of mosses are:

1. Moisture. Moss habitats range from sunny bare rocks to fully aquatic systems. In the woods you will find some mosses growing in quite wet soil while others grow in seemingly dry and bare sunny spots along trails. Make careful observations and pick mosses from sites most similar to those in your garden.

2. Sunlight. Some mosses thrive in full sun, while others need almost full shade. Moderate diffuse light appears to be best for the widest range of mosses.

3. Soil or substrate. Many mosses have very specific substrate requirements, such as clayey soil, sandy soil, humus, decaying wood, granitic rocks, or calcareous rocks. It is important to pick mosses from substrates comparable to those in your garden.

4. Soil disturbance. Some mosses are commonly found growing in areas where the soil has been previously disturbed, but I have found that most thrive best if the substrate is left as undis-

turbed as possible.

5. Protection from the wind. Wind causes desiccation. Therefore, to encourage mosses in an area with a fair amount of wind, install some type of barrier, such as a bamboo or cedar screen, shrubs, or a rock barrier.

6. Minimal detritus or leaf litter. Mosses do not thrive well under a covering of leaf litter or decaying vegetation. The area needs to be kept free of excessive debris.

7. No competition. For the Moss Garden at the Bloedel Reserve on Bainbridge Island, Washington (Lowry 1990), plugs of Irish moss (*Sagina subulata*, a flowering plant, not a true moss) were planted to provide an environment conducive to moss growth. In my garden, however, I found that true mosses grow best where they do not have to compete with vascular ground covers.

8. Low nitrogen. Although some mosses do thrive in high nitrogen conditions, low nitrogen appears to be more suitable for those mosses that form extensive beds.

9. High phosphate. Robert Muma (1986) suggests adding phosphate to encourage moss growth. Since I have let mosses grow in my garden naturally without the addition of minerals to the soil, I cannot verify this suggestion.

Cultivation

I have not actively introduced mosses into my garden, but have allowed them to invade the area naturally. It takes longer to develop moss patches in the garden this way, but the mosses are sure to be growing in sites most suitable to them.

If you do wish to actively introduce mosses, you must first prepare a site for each species. I suggest raking the area and grading it to the contour you wish. For small areas under the shrubs, keep the areas clear of fallen leaf debris. For a large area, the moss bed will look more natural on undulating ground rather than on a uniformly flat surface. Arrange groups of rocks and boulders, perhaps some rotting logs. Make the area as natural looking as possible. Alternatively, mosses also can be very appealing as an extensive ground cover in a more formal garden.

When collecting mosses, remember that it is unlawful to collect any plant material from our national, state, city, and county parks. If you wish to collect from National Forest lands, you must first obtain a permit from the District Ranger's office. Do not collect along the edges of roads and trails so that the scenic beauty is maintained for

others. Only take a very small piece of moss from any one area.

For mosses that are firmly attached to the substrate, you should use a flat bladed trowel or shovel to slice into the soil beneath the moss, then carefully lay the moss and soil into a box, keeping it flat and moist. This slice of moss and soil can then be laid on to the prepared and *dampened* site in your garden. Tamp it down very lightly and water lightly daily until established.

Another method of transplanting moss is to gather a moss clump and let it dry. Rub between your hands to break up the plants, then scatter over the moistened soil. Iwatsuki and Kodama (1961) recommend mixing the dried moss with soil. Scatter this mixture over the prepared soil and tamp lightly.

If you want to encourage mosses on rocks, here are several ideas I've heard about but have not tried. Brushing the rocks with rice water, carrot water, or potato water is said to encourage moss growth. Another possibility is to collect moss from the same type of rock as that in your garden. Grind up the moss plants in a blender and mix with either egg white or buttermilk. Brush this mixture on the rocks. A third possibility is watering the rocks on a regular basis to encourage the natural development of moss growth. After having her garden landscaped, Peggy Church of Redmond, Washington, wet her landscaping rocks every afternoon for two years if it hadn't rained that day. She had significant moss growth more quickly than usually occurs naturally.

Maintenance

In general, mosses are tough little plants and will survive cold, heat and drought. The main requirements of your new moss bed will be watering, weeding, and keeping it clean of debris.

To keep your moss bed looking its best during hot summer days, you may want to provide a light spray of water occasionally. Of course, many mosses are quite tolerant of dessication, so you can let them dry up during dry spells because they will quickly become revitalized when the rains begin again. Watering is really unnecessary after the plants are well established. And, of course, the mosses never need fertilizing.

Mosses are small and slow growing, so it is easy for fast-growing vascular plants to quickly crowd out even an established moss. Be sure to keep the area weed free to give the mosses a fair chance.

Although some authors say that mosses will choke out weeds, John L. Creech (1984) thinks a moss carpet is a most suitable nursery for seedlings. It may be the moisture level in a moss bed that helps seed germination, because I find many seedlings in moss-covered ground. Conversely, as a ground cover, mosses usually will not be over-invasive as are many vascular ground covers.

An occasional light raking to remove debris will be necessary, but do it carefully so as not to rake up the moss. In Japan, workers rake the moss-covered surfaces with soft, flexible brooms. For moss mats that are loosely attached to the substrate, hand pick debris off the surface or use a gentle blower.

Your moss beds will be disturbed by birds seeking nesting material or insects. Romping squirrels and foraging raccoons also can create havoc with moss. Robert Muma (1988) suggests making wire cages to cover newly laid mats of moss for protection from animals.

Most mosses do not take kindly to being trampled on a regular basis, but many can tolerate occasional foot traffic once established. Running dogs and children will quickly disrupt even a well-established moss bed.

Beds of mosses in the garden can provide delightful patches of color, texture, or both, as well as giving a feeling of tranquility to your garden. If you have chosen the appropriate species for any particular location, the plants are probably the least demanding in the garden once they have become established.

Virginia Lee Ellis has been an active member of the Washington Native Plant Society for 14 years and first became captivated by the study of mosses 12 years ago. She is a member of The Arboreum Foundation.

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Vine Maple

by Brian O. Mulligan

The discovery of vine maple (**Acer circinatum*) was made by the British expedition visiting the Pacific coast in May 1792, led by Captain George Vancouver and naturalist-doctor Archibald Menzies. The location was Port Discovery Bay on the north shores of what is now Washington State's Olympic Peninsula (Newcombe 1923). Vine maple still grows there, along U.S. Highway 101, as well as the native madrona (**Arbutus menziesii*), manzanita (**Arctostaphylos columbiana*), and **Rhododendron macrophyllum*, all of which were duly noted by Menzies in his journal.

The next recorded discovery of vine maple was by Meriwether Lewis in 1806 on the Oregon State side of the Columbia River. From his specimens it was then officially described by Frederick Pursh in Philadelphia in 1813. The species name *circinatum*, meaning "of circular shape," must have been coined because of the shape of the dried leaves of the specimen he examined. It remained for David Douglas to introduce it to British nurseries and gardens in 1826, but I have not discovered the source of his seeds. Twelve years later, plants from this origin had both flowered and fruited in England (Loudon 1838). W.J. Bean (1970) stated of this species: "It is an admirable subject for a lawn in a small garden," so it has been very successful in British gardens over a long period.

The native range of vine maple extends from Alaska to northern California, including the Walla Walla mountains in northeastern Oregon, up to more than 4,000 feet in elevation.

Description and Garden Uses

In the wild, vine maples are commonly seen along roadsides or on the margins of woodlands or forests. In October, they are particularly conspicuous along U.S. Highway 2 on the east side of the Cascade range from Stevens Pass to Leavenworth. At that time, the foliage is turning orange to red or scarlet, especially on steep, rocky slopes that may have more moisture beneath them than we realize from the highway. They are found all over the Washington Park Arboretum, with an especially beautiful one east of the Graham Visitors Center, across Arboretum Drive East.

In our gardens it is desirable, if possible, to give vine maples a site where they receive morning sun,

rather than facing west or south during our usually dry summers. In any case, an annual mulch of old leaves or compost over the root area would certainly be beneficial. Anticipate an eventual height of 20 to 30 feet, with a branch spread of about two-thirds the height. Multi-stemmed plants are more common in gardens than single-stemmed, so if a single-stem form is preferred, then they must be pruned from an early stage.

Vine maples have some value through most of the year. In winter, the tough gray-green stems may be decorated with lichens and look their best after a heavy rain. In spring, the paired buds open to produce the crumpled young green leaves, then clusters of pendulous flowers in which the outer ring of the flower (sepals) are purple and the shorter petals white.

The green summer leaves of the vine maple are shallowly nine-lobed, with serrate margins (saw-toothed leaf edges); the blades are three to four inches long and wide, on stalks (petioles) about half that length holding them more or less horizontally, especially in shady situations. Prominent main veins extend from the top of the petiole to the apex of each lobe.

From early August onwards, the paired one-inch-long winged seeds, held horizontally, begin to change color, becoming red first at the base then gradually extending upwards. (See a color photo on page 16.) When fully colored, they add much to the value of this maple in our gardens and woods, but unfortunately they also attract squirrels; the ground beneath a tree can become littered with discarded fruits deprived of their contents. If needed for propagation purposes, the seeds should not be allowed to dry out; either sow them immediately or store in moist peat in a refrigerator until early the following spring.

Old vine maples make excellent supports for **clematis* or other not-too-vigorous climbing plants. In this way, they can extend their season and value in a garden.

Brian O. Mulligan is director emeritus of the Washington Park Arboretum.

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Sword Fern & Anderson's Fern

by Genie Stewart

On my first hike into a Northwest forest, I had the lovely, mysterious feeling of walking into a storybook setting. The most striking plants were the sword ferns, covering the forest floor like a tapestry with the repeating patterns and texture of their deep green fronds.

In the Midwest, where I grew up, ferns are considered a luxury. Here in the Northwest, people often scoff at them as if they were weeds. I feel they have many virtues in my garden.

Sword ferns (**Polystichum munitum*) are evergreen. They brighten corners and nooks of my yard in winter when few plants are green. They tolerate almost any garden situation—cold, wet winters and dry summers. They will grow in places where it is cool and shady in the morning and then blasting hot sun in the afternoon without a sign of wilt or scorch. They grow under the dry shade of a Douglas-fir with little watering. I have even seen them growing between the bricks of abandoned downtown buildings. Find them all over the Washington Park Arboretum.

The only pests that attack them are aphids, which appear on the underside of the fronds in unusually cool, wet springs. However, they do no long-term damage to the plants. Sword ferns put up with being transplanted at almost any time of the year as they outgrow one spot and another needs filling in. They can be moved at almost any time of the year into any type of soil, as long as they are watered regularly through the first season. Sword ferns make good companion plants to just about any Western Washington native shrub or ground cover.

Polystichum andersonii is also a Northwest native fern, though not as common in the wild as *P. munitum*. Its fronds are deeply divided, giving it a more lacy appearance. The color is a slightly lighter shade of green than the sword fern. Anderson's sword ferns are equally as cold hardy, but will not tolerate quite as much sun and need more water when they are young. They can easily be propagated by pinning the fronds to the ground with small rocks next to the nodes that grow near the tips. Anderson's ferns can be seen on the Perry Creek trail off the Mountain Loop High-



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way. Plants can be obtained in the fern department at nurseries and plant sales, or from a friend with a parent plant.

After 25 years of living in the Northwest, I still appreciate sword ferns, especially some that have remained in one spot long enough to grow three to four feet high. My only regret is that I do not have enough space to create a carpet of them in my yard.

Genie Stewart has been a member of The Arboretum Foundation and the Northwest Native Plant Study Group for about 16 years. She has been gardening with native plants for as many years. Genie currently volunteers for the United States Forest Service on revegetation projects in the Alpine Lakes Wilderness.

Sedges

by Clayton Antieau

For gardeners or designers who use native plants in their gardens, the standard list of potential ornamental and useful Pacific Northwest species may seem manageable at first. Real truth appears, however, only after many of the commonly used or readily available native plants have been observed, grown, tested, and admired; these gardeners then seek more. The actual list of native species with horticultural potentials is of staggering proportions.

To illustrate this, I am pleased to report on two species that have thrived in my Seattle garden this past season, and which provide unique ornamental features to this pleasant place. The species are sedges (*Carex* spp.), a group of poorly appreciated, infrequently studied, and rarely cultivated native plants that have abundant diversity in habitat requirements and ornamental features. In general, sedges have been ignored by most people as "indistinct" or "difficult to identify" because of their characteristically inconspicuous and complex flowers. In contrast, when these sexual features are understood and closely examined, sedges sort themselves into distinct, relatively easily identified species. One can then begin to consider their use in gardens.

Few native Northwest sedges are available in the nursery trade. Those that are tend to be used for environmental restoration activities in wetlands, since sedges are wetland species. Because most gardens are not wetland gardens, what native sedges tolerate average garden conditions? This is a question for which I might provide some preliminary and tempting answers.

Over the last year, I have propagated and grown two sedges that thrive in my normal garden conditions. The sedge I propagated from seed is the fox sedge (*Carex vulpinoidea*), known from east of the Cascades and northern Puget Trough in Washington, and on Vancouver Island in British Columbia. The species also inhabits across northern latitudes to Newfoundland. The sedge I propagated by division of a native-found clump is called Henderson's sedge (*Carex hendersonii*). This sedge is found in low elevation sites in the west Cascades of Washington and Oregon, and in a small area in Idaho, and in northern California.

Both sedges are found in wetland environments within their respective ranges. Fox sedge is found



Carex hendersonii

Clayton J. Antieau

in the periodically flooded (and thus, periodically dry) shorelines of lakes and rivers, or freshwater emergent wetlands. Henderson's sedge is usually found in the shade of well-developed deciduous and coniferous forests, and sometimes in moist or wet spots therein.

The beauty of these sedges is found in their foliage. Both species form tight clumps of dark green leaves. Fox sedge has narrow, deciduous leaves arching gracefully to reach 2 feet in length. The effect is fountain like, and stunning *en masse*.

Henderson's sedge exhibits deeply pleated, $\frac{3}{4}$ -inch wide, strap-like semi-evergreen leaves. This species provides bold spots of neutral green in the garden, in addition to profusions of wand-like 2-foot-tall leafy stalks with inconspicuous flowers. Both species combine well with grasses and other ornamental sedges. They also provide unique textures and visual rest stops in a garden of color.

I have irrigated my plants only to ensure establishment in their garden situations during the hot and dry spring and summer of 1992. Both species have grown well, with plants of Henderson's sedge increasing impressively in size in a single season. Both species appear to prefer a moist (not necessarily wet) and sunny location. Henderson's sedge tolerates dry shade once established.

These sedges are not available in nurseries to my knowledge. Both species tend to be uncommon (but not unusual) in Washington. Unfortunately, the best way to obtain plants is to know that rare gardener who grows them and to beg a division. Hopefully, as nurseries explore and expand the production of native plants, these and other native sedges suitable for the ornamental garden will become available.

Clayton Antieau is a horticulturist, botanist, and instructor specializing in native flora of the Pacific Northwest. He is executive president of the Washington Native Plant Society.

Book Review

The Natural History of Puget Sound Country.

Arthur R. Kruckeberg. Seattle:
University of Washington Press, 1991.
ISBN 0-205-97019-7. \$40.00, paper.

Urban sprawl, gridlocked highways, polluted air and water, and indistinguishable malls often alienate Puget Sound residents from the natural world. Yet a crystal clear winter day with a view of the soaring Olympic Mountains and, as early explorer Archibald Menzies described it, a breath of the "salubrious and vivifying air," can overcome them all and cause us to reflect on the wonder and beauty of our Northwest home. This book by the dean of Northwest botanists can have the same effect.

In his excellent introduction to the area for both newcomers and long-time residents. Dr. Kruckeberg approaches the topic of the Puget Sound's natural diversity holistically. He gives an overview of all the major physical and biological factors influencing the area. Kruckeberg clearly conveys a sense of delight and wonder about the subject while maintaining a strong empirical foundation.

Kruckeberg begins with geology and climate, two factors with a profound influence on life in the Puget Sound country. Often superficially covered in natural history guides, these topics are treated with the importance they deserve. The interesting account of the regional weather explains the source of Seattle's famous rain and may give the reader more cause to appreciate the mist rather than curse it.

Although the book divisions are more or less traditional—plants, animals, and so on—Kruckeberg discusses each topic from an ecological approach. Each chapter builds upon the preceding chapters as the author pulls together the natural components of the region. He highlights the major attributes of each topic and whets the reader's appetite for more information. Then he generously provides the reader with sources for further investigation.

Throughout the book, the relationship of humans to the natural world is a recurrent theme. In the final chapters, Kruckeberg contrasts the impacts of the two great waves of human immigration into the area. He concludes with an eloquent plea for the development of a land ethic to protect this marvelous natural legacy.—*Reviewed by Mark Sheehan*

Mark Sheehan is a native of the Puget Sound Country. He is a biologist and the manager of the Washington Natural Heritage Program, whose mission is the protection of the biological diversity of Washington.

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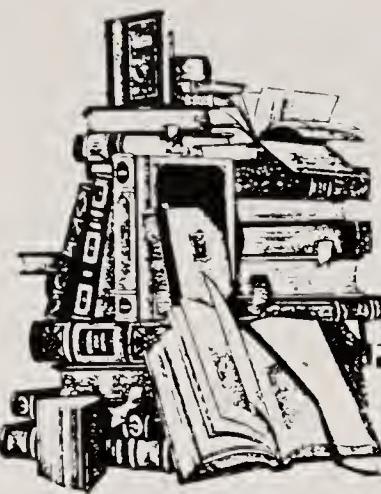
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New on the Shelves of the Elisabeth C. Miller Library



by Valerie Easton

Several books published this year and new on the library shelves deserve special notice.

The New Royal Horticultural Society Dictionary of Gardening. London: MacMillan Press Ltd., 1991. ISBN 1-56159-001-0. The dictionary has come out in four volumes in the first revision in more than thirty years. As useful as it is impressive, it includes entries for such diverse topics as Pierre-Joseph Redoute and wingless weevils, with lengthy and informative essays on topics such as hardiness, ecology, and the conservation of gardens. An extensive glossary and bibliography are of particular use because of their currency. Four-hundred pages of botanical illustration and descriptions of 60,000 garden plants, complete with cultivation notes, make this set the first—and often last—step in answering garden questions.

Seeds of Woody Plants in North America by James A. and Cheryl G. Young. Portland: Dioscorides Press, 1992. ISBN 0-931146-21-6. This is another long-anticipated major revision of a well-known older work. The twenty-year-old *Seeds of Woody Plants in the United States, Agricultural Handbook 450* has been updated and greatly expanded to reflect the increase in knowledge about the propagation of woody plants. The new edition covers more than twice as many genera, adds a thousand literature citations, and includes information on tissue culture techniques. The main focus of the book, however, remains propagation from seed. This is also the place to find photos and drawings of seed of 386 genera, as well as detailed information on stratification, germination, prechilling, and all other aspects of the propagation of woody plants from seed.

Wilkinson, Elizabeth, and Marjorie Hender-

son, editors. *Decorating Eden: A Comprehensive Sourcebook of Classic Garden Details*. San Francisco: Chronicle Books, 1992. ISBN 0-8118-0124-1. An update of the unique and successful 1985 *House of Bougs*. Encyclopedic in both arrangement and breadth, this is a collection spanning history and cultures of designs and structures for the garden. Look here for descriptions, photos, and illustrations of Chinese paths, Victorian summer houses, floral sundials, Spanish fountains, and ha-has (an English retaining wall used as a barrier between garden and pasture). The current listing of suppliers makes this a useful sourcebook, but use it also for design ideas (where else to find pages of ideas on pavings or gateways?) and garden inspiration.

Jacobson, Arthur Lee. *Trees of Green Lake: Trees of Seattle's Favorite Park*. Seattle: Arthur Lee Jacobson, 1992. ISBN 0-9622-918-1-1. A new book by Seattle's own tree expert gives a month-by-month overview of seasonal changes to appreciate, as well as descriptions of the 162 trees of Green Lake. "Descriptions" is too dry a word for these lively, personalized, and knowledgeable essays. "Alder is like a dishrag—indispensable, but no thing of beauty. In a weird way, it almost compels a grudging admiration from us, for it carries plainness of appearance to the level of high art." Locations, history, and information on native trees makes this an enjoyable and invaluable handbook to carry with you when circling Green Lake.

American Horticultural Society, compiler. *North American Horticulture: A Reference Guide*. 2nd ed. New York: MacMillan Publishing Company, 1992. 0-02-897001-2. This indispen-

sable directory is finally out in a new edition. No other reference book covers the whole field of horticultural organizations and programs in the United States and Canada. Thousands of current entries include educational programs, garden clubs, plant societies, herbaria, governmental programs, horticultural libraries and periodicals, arboreta, botanical gardens, and even cemeteries with notable gardens. See page 309 for a nice description of the Washington Park Arboretum and twenty other gardens to visit in Washington.

Also New:

American Hemerocallis Society. *Daylilies: The Beginner's Handbook*. Rev. ed. Jackson, MS: American Hemerocallis Society, Inc., 1991. ISBN 0-9631072-0-8.

Beales, Peter. *Roses*. New York: Henry Holt and Company, 1992. ISBN 0-8050-2053-5.

Bennett, Jennifer. *Lilies of the Hearth: The Historical Relationship between Women and Plants*. Camden East, ONT: Camden House, 1991. ISBN 0-921820-27-5.

Billington, Jill. *Architectural Foliage*. London: Ward Lock Ltd., 1991. ISBN 0-7063-6962-9.

Coats, Alice M. *Garden Shrubs and Their Histories*. New York: Simon and Schuster, Inc., 1992. ISBN 0-671-74733-9.

Dearborn, Jeffrey. *How to Prevent Pesticide Pollution: Silent Suicide, the Risk with Pesticides*. Beaverton, OR: DHJKL Publishing Company, 1991. ISBN 0-9630134-0-8.

Festing, Sally. *Gertrude Jekyll*. London: Viking, 1991. ISBN 0-670-82788-6.

Frederick, William H. *The Exuberant Garden and the Controlling Hand*. Boston: Little Brown and Company, 1992. ISBN 0-316-29255-9.

Jordan, Cora. *Neighbor Law: Fences, Trees, Boundaries and Noise*. Berkeley, CA: Nolo Press, 1991. ISBN 0-87337-158-5.

King, Peter, and Graham Rose. *The Good Gardens Guide 1992: Over 1,000 of the Best Gardens in Great Britain and Ireland*. London: Vermillion, 1991. ISBN 0-09-175240-X.

Knopf, Jim. *The Xeriscape Flower Gardener: A Waterwise Guide for the Rocky Mountain Region*. Boulder: Johnson Books, 1991. ISBN 1-55566-077-0.

Morris, Karen, and Lyle E. Craker. *Herb Gardens in America: A Visitor's Guide*. Amherst, MA: HSMP, 1991. ISBN 0-9629868-0-1.

The National Gardens Scheme Charitable Trust. *Gardens of England and Wales*. Surrey, UK: The National Gardens Scheme Charitable

Trust, 1992. ISBN 0-900558-24-5.

Reader's Digest Association Ltd. *A Garden for All Seasons*. Reader's Digest Association Ltd.: Pleasantville, NY, 1991. ISBN -276-42011X.

Schenk, George. *Gardening with Friends*. New York: Houghton Mifflin and Company, 1992. ISBN 0-395-60976-3.

Schmid, W. George. *The Genus Hosta*. Portland: Timber Press, Inc., 1991. ISBN 0-88192-201-3.

Taylor, Jane. *Creative Planting with Climbers*. London: Ward Lock Limited, 1991. ISBN 0-7063-7015-5.

Vanderplank, John. *Passion Flowers and Passion Fruit*. Cambridge, MA: The MIT Press, 1991. ISBN 0-262-22043-1.

The Elisabeth C. Miller Library is located at 3501 N.E. 41st, Seattle, WA. Hours are: Monday, 9 a.m.-8 p.m. Tuesday through Friday, 9 a.m.-5 p.m. Each Monday, from 4 p.m.-8 p.m. year round, the Miller Library participates in the Washington Garden Clinic at the Center for Urban Horticulture where the public can have plants identified. The Washington State University/King County Master Gardeners are there for consultation. Library specialists are available to find the written resources that you wish to consult.

Errata

Volume 55:2 (Summer 1992)

Page 7. The design committee for the mixed border at the Bellevue Botanic Garden consists of Charles Price, Glenn Withey, Bob Lilly, and Carrie Becker. Anne Lovejoy served as a member of the committee in the area of fund raising. The border was planted by the design committee and a host of dedicated volunteers from Northwest Perennial Alliance. Planting and caretaking is an ongoing process sponsored and carried out by the NPA under long-term contract with the Bellevue Parks Department.

Page 10. Should be *Rhododendron occidentale* x 'Irene Koster'.

Page 16. *Hydrangea macrophylla* 'Goliath' is pictured on this page.

Page 17. *Hydrangea macrophylla* 'Marechal Foch' is probably the hydrangea pictured lower left.

Page 18. Jeanne Gardiner is the correct spelling.



Mary Levin, University Photography,
University of Washington

In the Washington Park Arboretum

by Timothy Hohn

Our Efficient Watering Program

With one of the driest growing seasons on record coming to a close, our drought losses have been negligible thanks to the diligence of our staff. Within the bounds of our irrigation system, we have a very efficient watering program crafted by Christina Pfeiffer, Arboretum horticulturist. Her staff continuously monitors daily watering needs, employs a diverse set of irrigation hardware for particular watering applications, and applies the water by hand for most new plantings to ensure adequate and efficient utilization. Even with some of our irrigation handled by an automatic system, summer irrigation still requires the stewardship of two of our half-dozen staff members.

Arborist Volunteers

On April 14 and August 21 of 1992, the Arboretum hosted groups of volunteer arborists who donate time to prune our trees. Eight different local tree care companies participated in these first two volunteer arborist work days in what amounts to a very generous in-kind gift to the Arboretum.

The participating companies were: Arboreal Services, Blue Heron Tree Care, Custom Tree Service, Davey Tree Expert Co., Chip Kennaugh Co., Seattle Tree Preservation, and Stonehedge Tree Care. Mike Webb, a part-time employee of Arboreal Services and regular Arboretum volunteer, donated additional time to help out. They all did a wonderful job that highly recommends them.

Magnolias

The generous members of Arboretum Foundation Unit 33 have made possible several new acquisitions for the magnolia collection with a recent contribution. The Arboretum magnolia collection is quite diverse regarding magnolia species

but has fallen behind concerning magnolia cultivars and hybrid cultivars. Unit 33 helped us acquire several hybrids and cultivars from Gossler Farms Nursery and we will be receiving many new selections of *Magnolia grandiflora* from Louisiana next spring.

The new acquisitions include: cvs. 'Caerhays Belle', 'Iolanthe', 'Mark Jury', 'Purple Prince', 'Ruby', 'Satellite', 'Serene', 'Star Wars', 'Schmetterling', 'Sundance', 'Vulcan', *Magnolia x loebneri* 'Spring Snow', 'Ballerina', *M. salicifolia* 'Iufer', *M. stellata* 'Jane Platt', and 'Waterlily'.

Other New Accessions

71-92 *Vitex agnus-castus* 'Silver Spire' (Verbenaceae): A striking white flowering form of the familiar Chaste tree, this small plant was received from the Holden Arboretum, Ohio; in the nursery.

79-92 *Itea virginica* 'Henry's Garnet' (Saxifragaceae): This beautiful shrub, which has drooping white pipe-cleaner inflorescences (flower clusters) in early summer and gorgeous fall color, will be a small plant; purchased from Heronswood Nursery, Kingston, Washington; not yet large enough for display.

105-92 *Rhododendron yakushimanum* 'Ken Janek' (Ericaceae): The lovely selection of the popular "yak" rhododendron has pink flowers that fade to white. It was donated by Briggs Nursery, Olympia, Washington, and can be found across from the Graham Visitors Center, north of the vine maple.

223-92 *Cercis canadensis* 'Forest Pansy' (Leguminosae): Wine-colored foliage makes this tree a special selection of the popular redbud. It was donated by Gossler Farms Nursery, Springfield, Oregon, and is not yet large enough for display.

Timothy Hohn is curator of living collections, University of Washington Center for Urban Horticulture and the Washington Park Arboretum.

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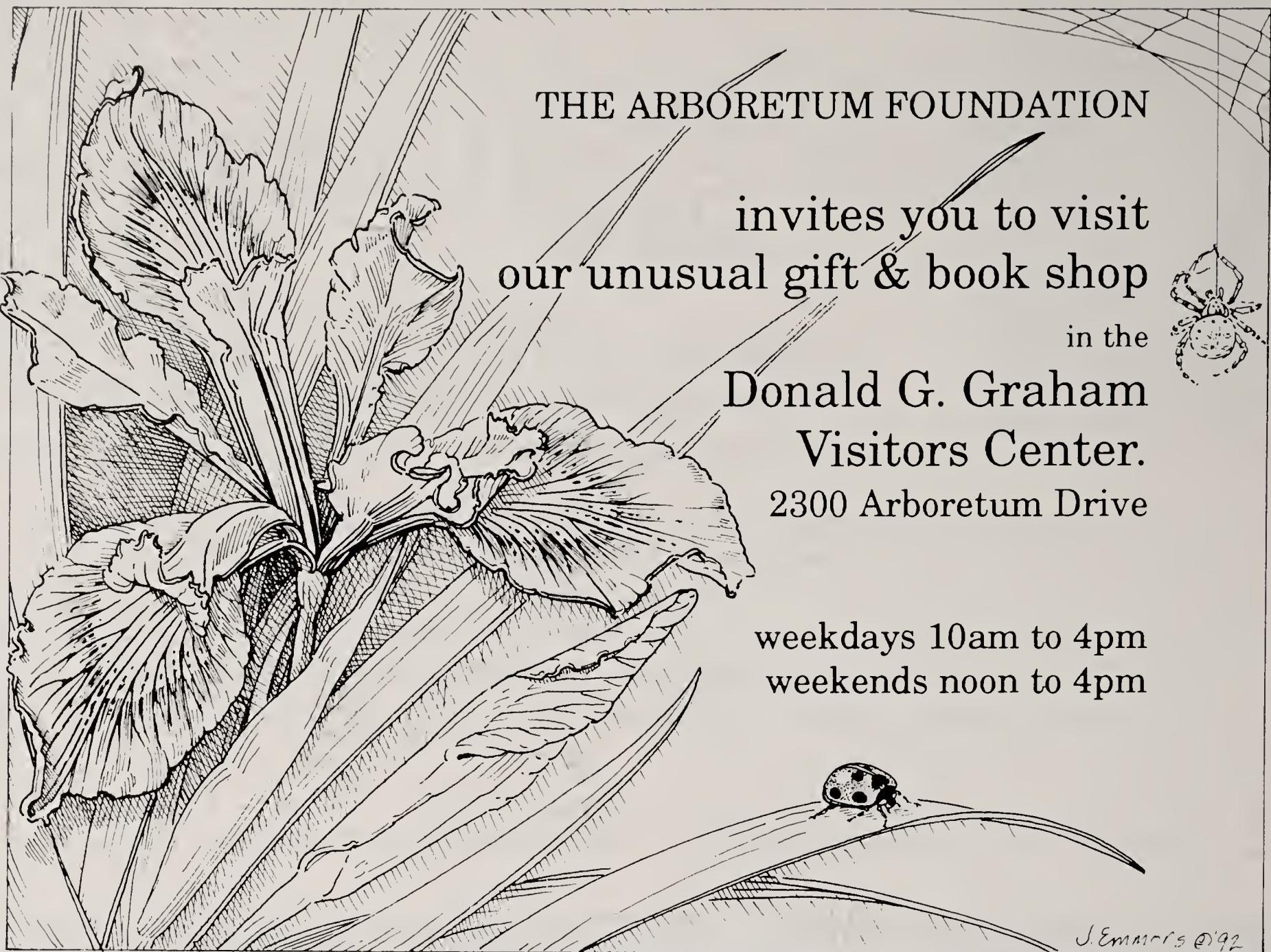
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